OCTOBER, 1954 — SIXTY-FIRST YEAR

MACHINERY

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M-R-C has long been known for leadership in the field of Super-Precision Ball and Roller Bearings. With our new factory in Falconer, N.Y., now in production, we are also manufacturing Instrument Ball Bearings of Super-Precision Quality.





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MACHINERY

VOLUME 61 · OCTOBER, 1954 NUMBER 2

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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A Demonstration of the LANDIS Thread Rolling Machine on your workpieces

THE WORLD'S LARGEST

The new LAN-HY-ROL Thread Rolling Machine offers a combination of precision, productivity, and flexibility in generating external threads unequalled by any other machine now available in the Western Hemisphere. Yet we believe that its superiority is so great that its unlimited potentialities cannot be understood without seeing actual operation.

Therefore, we are offering all manufacturers an operating demonstration of the new LAN-HY-ROL, using your own workpieces if you prefer. Send us the necessary thread specifications and prepared workblanks—we will make the dies required at our own expense, then arrange an operating demonstration here in Waynesboro at your convenience.

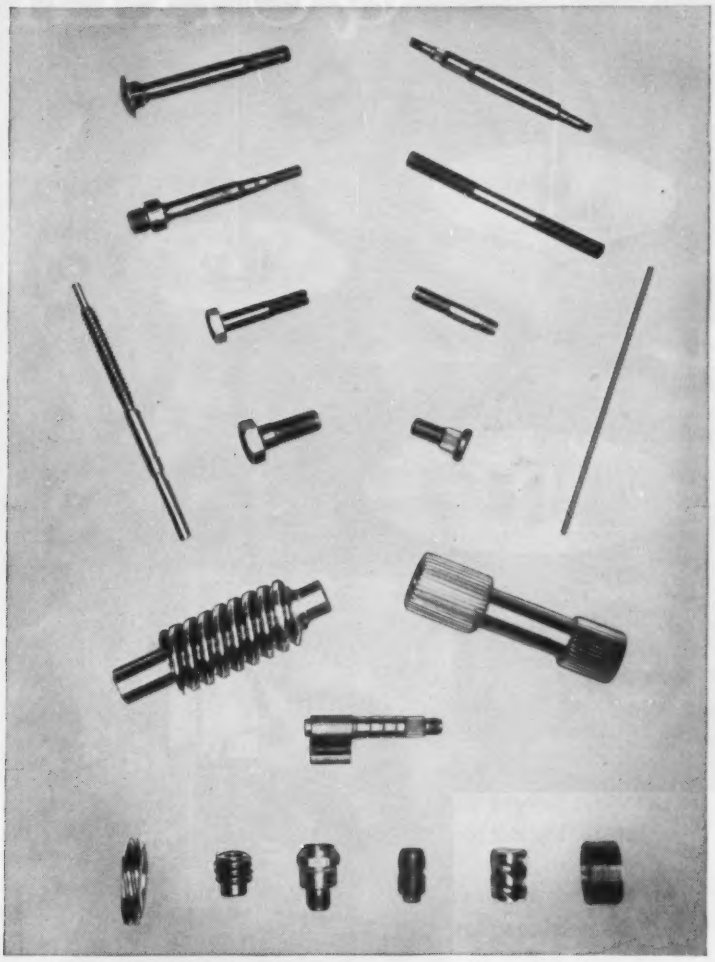
The new LAN-HY-ROL is based on a rolling system using two circular thread rolling dies and a work support blade. It will produce UNC and UNF threads to tolerances up to and including Class 4, and will also roll Acme, worm, and other special threads. The LAN-HY-ROL will roll threads from 3/16″ to 3″ in diameter up to 5-7/8″ long by plunge rolling, and up to 72″ by thrufeed rolling. It can also be equipped for automatic hopper feeding, semi-automatic hand feeding, or rolling special threads between centers.

Plan today to investigate the cost-saving advantages of the new LAN-HY-ROL Thread Rolling Machine. Contact us direct in Waynesboro, or through one of our field representatives, about arranging a demonstration.

408-C

LAN-HY-ROL

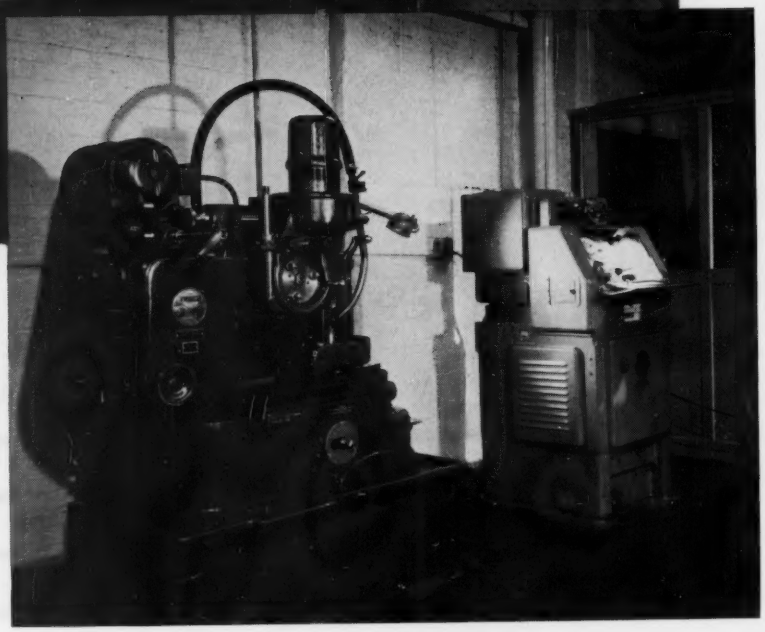
MANUFACTURERS OF THREADING EQUIPMENT—CUTTING—TAPPING—GRINDING—ROLLING



LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

FELLOWS-CUT QUALITY





THE *Fellows*

. . . *basic* for GEAR TRAINS in ELECTRONIC INSTRUMENTS



Runout tolerances to 'two tenths' are an everyday requirement in a train of gears so perfect that they spin freely at the lightest finger touch.

This unit, with gears from a production lineup of Fellows Gear Shaper, Shaving Machine and "Red Liner" at the Electronic Instrument Division of Ketay Manufacturing Company, New York, is evidence of the results of quality-control at its best.

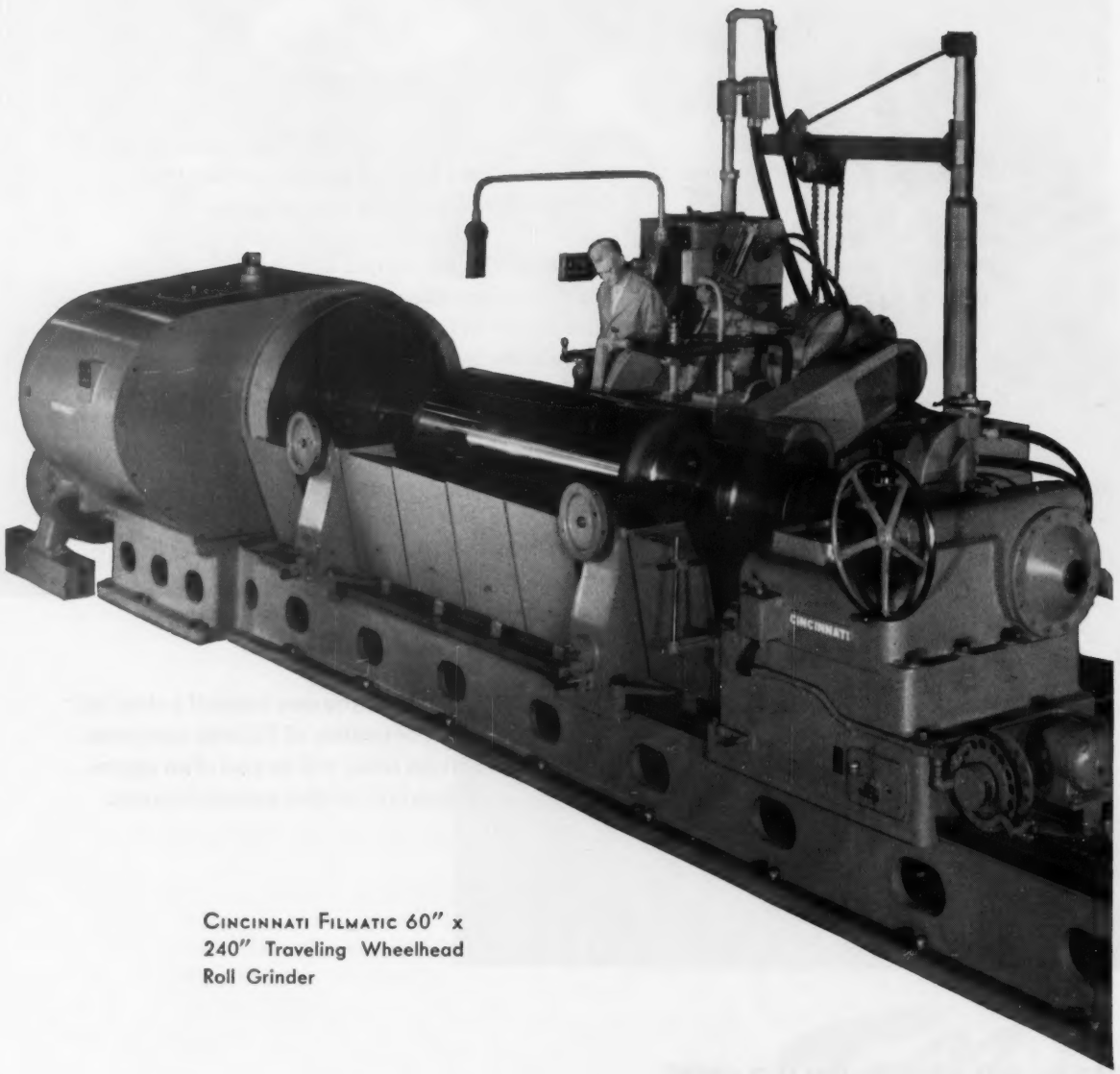
In spite of the greater accuracy demanded for these sensitive electro-mechanical devices, gear production costs are still of vital importance. The ability of Fellows machines and tools to hold costs under control and to work within the most critical tolerances is being proved every day on the production lines of many industries.

If you have gears to cut, you owe yourself a close look at the cost-control potentials of Fellows equipment. The nearest Fellows Office will be glad of an opportunity to send literature or offer personal counsel.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
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For Lower Cost, Better on Sheets and Foil



CINCINNATI FILMATIC 60" x 240" Traveling Wheelhead Roll Grinder

Quality Finish

. . . equip your roll shop with

CINCINNATI FILMATIC ROLL GRINDERS

Low cost in roll grinding depends largely on the grinding wheel spindle bearings, for that's where down time and maintenance usually start. FILMATIC spindle bearings, an exclusive feature of CINCINNATI Grinding Machines, completely eliminate bearing maintenance expense. And they require no adjustment when changing from one type of roll grinding job to another. Other advantages offered by CINCINNATI FILMATIC Traveling Wheelhead Roll Grinders include built-in automatic wheel balancing; infinite number of grinding rates through electronic control of carriage traverse; automatic lubrication with filtered oil; wide range of convex and concave cambers obtained with double eccentric, tilting wheelhead cambering unit. Our roll grinder specialist will be happy to tell you more about these machines and their relation to high-quality, low-cost rolled products. May we hear from you?

CINCINNATI GRINDERS INCORPORATED
Subsidiary of The Cincinnati Milling Machine Co.
CINCINNATI 9, OHIO

Specifications

Traveling Wheelhead Roll Grinders

four sizes	36", 44", 50", 60"
length between centers	up to 24 ft.
infinite work speeds	36"—9 to 32 rpm
	44"—8 to 28 rpm
	50"—7 to 25 rpm
	60"—6 to 21 rpm
infinite carriage traverse rates	¾" to 75" per min.
power rapid cross traverse	20" per min.
motor drives: wheelhead	30 to 40 hp
headstock	up to 30 hp
wheel carriage	1½ hp



CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

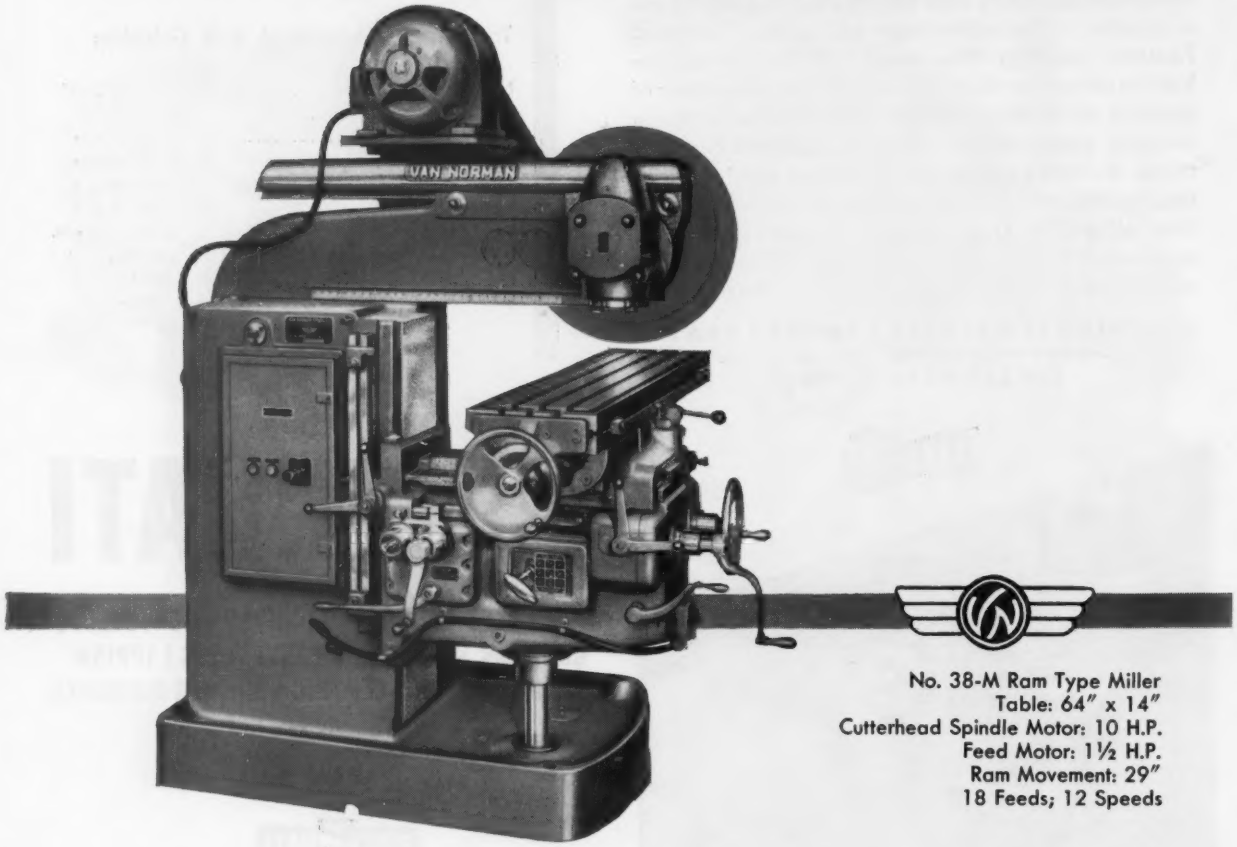
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Van Norman Ram Type Miller

Gives You EXTRA "CUT-ABILITY"

that INCREASES Production

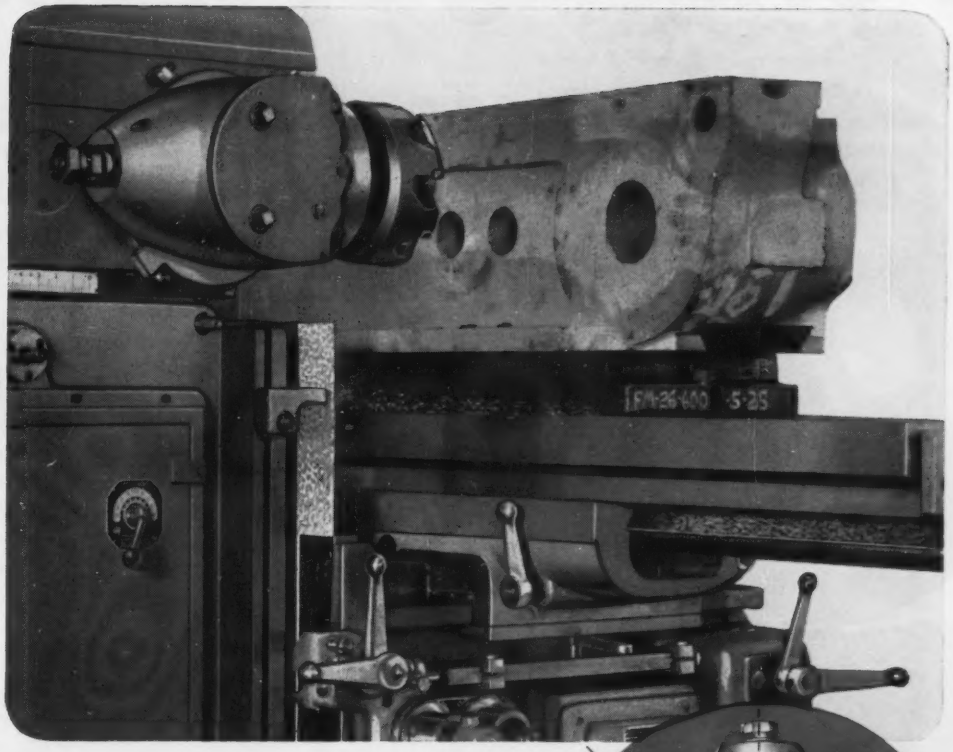


No. 38-M Ram Type Miller
Table: 64″ x 14″
Cutterhead Spindle Motor: 10 H.P.
Feed Motor: 1½ H.P.
Ram Movement: 29″
18 Feeds; 12 Speeds

VAN NORMAN

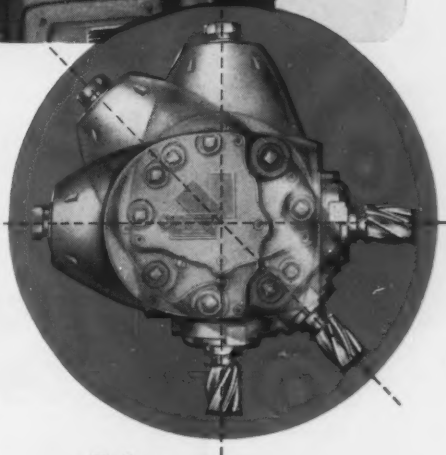
MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

For more information on products advertised, use Inquiry Card, page 243



You simply can't beat the new Van Norman Ram Type Millers for "Cut-Ability". The powerful spindle motors drive the cutterhead only... provide ample power for every milling cut with all types of cutters including *carbide cutters.* The extra heavy movable rams plus larger, heavier column, base and knee, saddle and table assemblies provide maximum rigidity.

Find out how you can increase production, cut milling costs with the new modern Van Norman Ram Type Millers. Write:



Plus **Maximum "FLEX-ABILITY" with the adjustable cutterhead.**

COMPANY SPRINGFIELD 7, MASSACHUSETTS

4 Grinding Operations

Versatility . . . an investment-saving advantage of Landis Universal Cylindrical Grinders

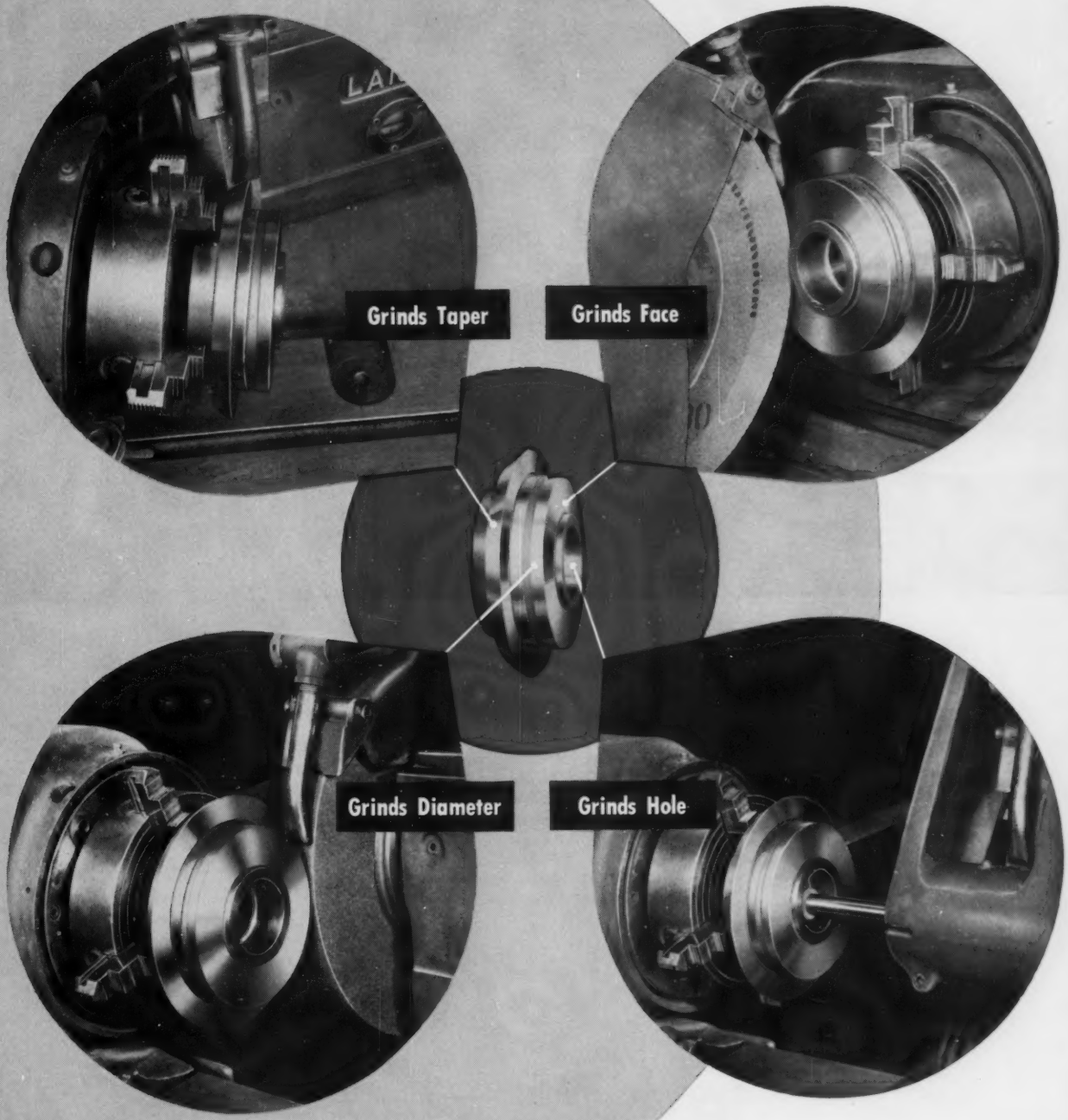


12" x 36" Landis Universal with swinging internal fixture and hydraulic rapid wheel head positioning.

LANDIS

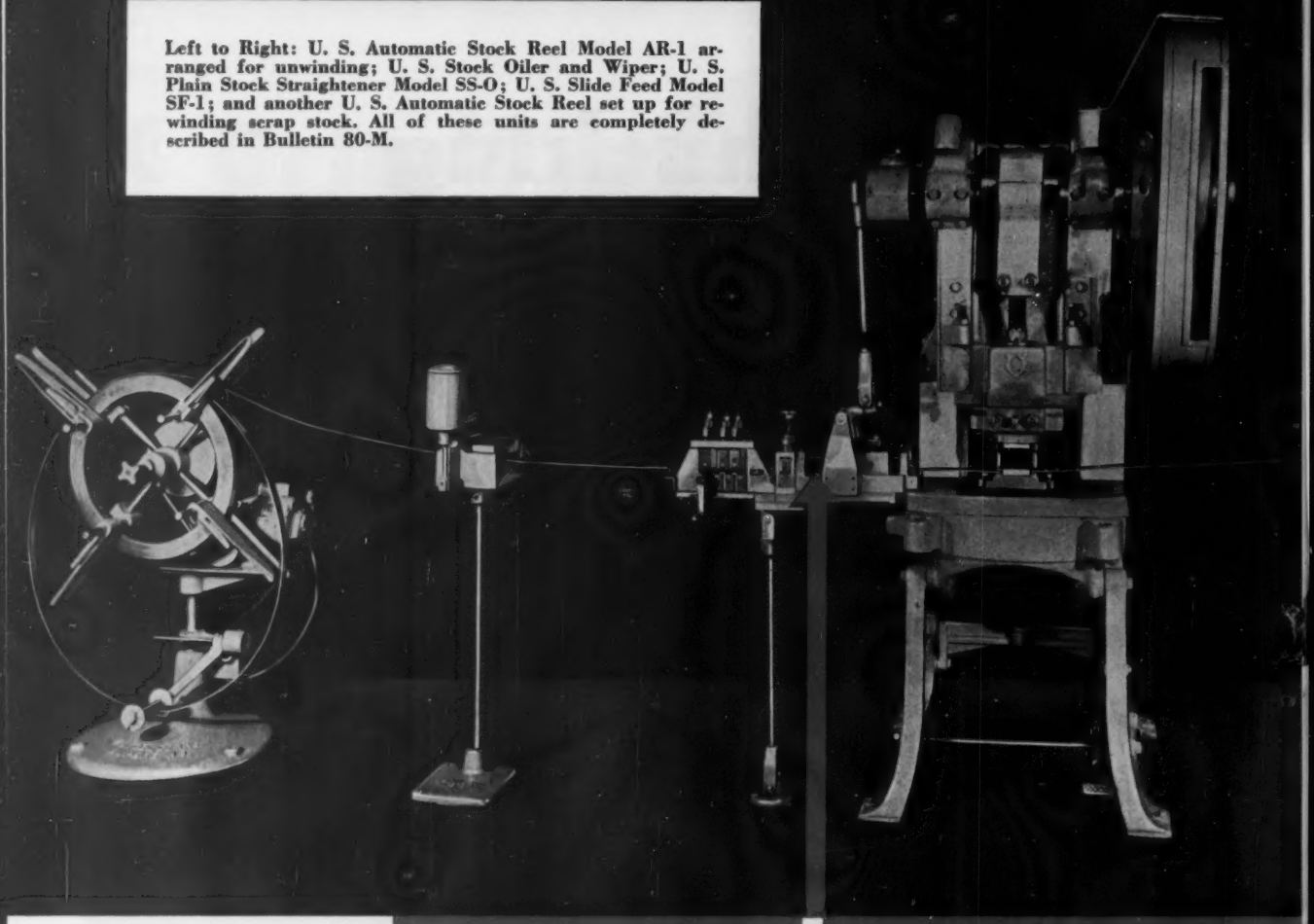
precision grinders

in One Chucking



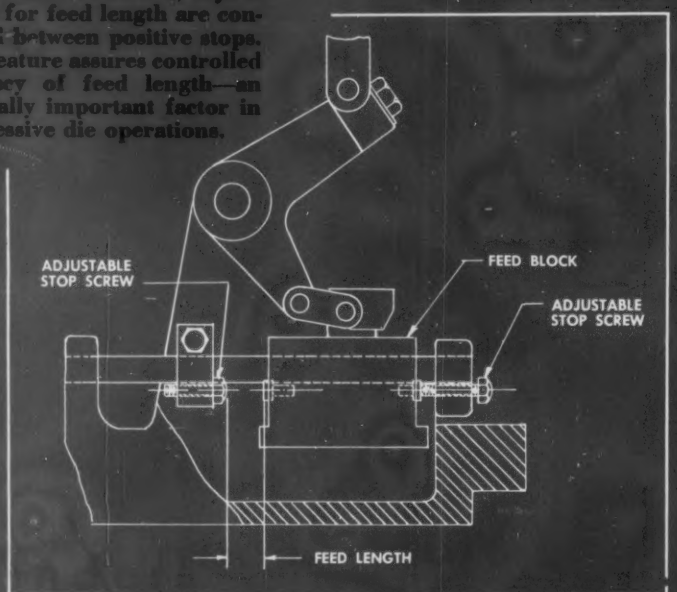
LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Left to Right: U. S. Automatic Stock Reel Model AR-1 arranged for unwinding; U. S. Stock Oiler and Wiper; U. S. Plain Stock Straightener Model SS-O; U. S. Slide Feed Model SF-1; and another U. S. Automatic Stock Reel set up for rewinding scrap stock. All of these units are completely described in Bulletin 80-M.



Positive Feed Length Adjustment

The drawing below shows how, in the U. S. Slide Feed, adjustments for feed length are controlled between positive stops. This feature assures controlled accuracy of feed length—an especially important factor in progressive die operations.





LOW COST AUTOMATION FOR YOUR PRESS ROOM

You can use U. S. Automatic Press Room Equipment to get all the advantages of automation at low cost. Illustrated is a typical set-up which converts a conventional punch press into an automatic machine by using two U. S. Automatic Stock Reels (one for unwinding the stock and one for rewinding it), a U. S. Stock Oiler and Wiper, a U. S. Plain Stock Straightener, and a U. S. Slide Feed.

A set-up like this gives you the double advantage of increased production and reduced labor costs, plus the added feature of flexibility. Within their capacity, all of the units shown can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops, as shown in the drawing on the opposite page, providing consistent accuracy that is especially valuable in progressive die operations.

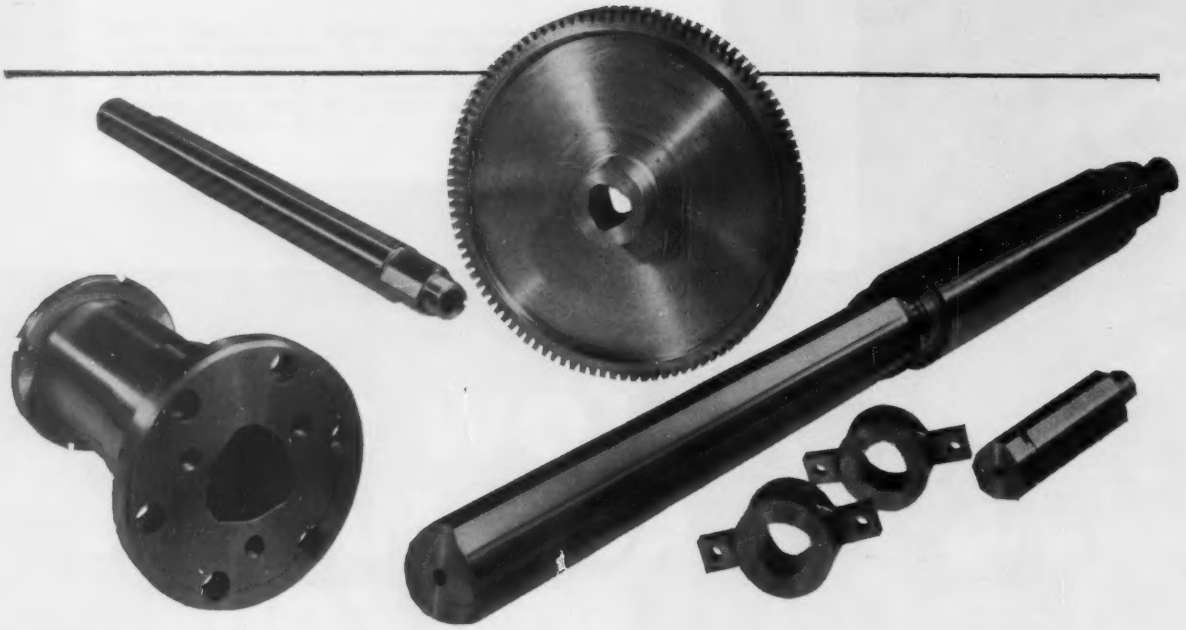
If you want to reduce costs and speed output in your press operations we suggest that you investigate the many advantages of U. S. Automatic Press Room Equipment. Bulletin 80-M gives essential facts about the complete line. Send for your copy.

U.S. TOOL COMPANY, Inc.

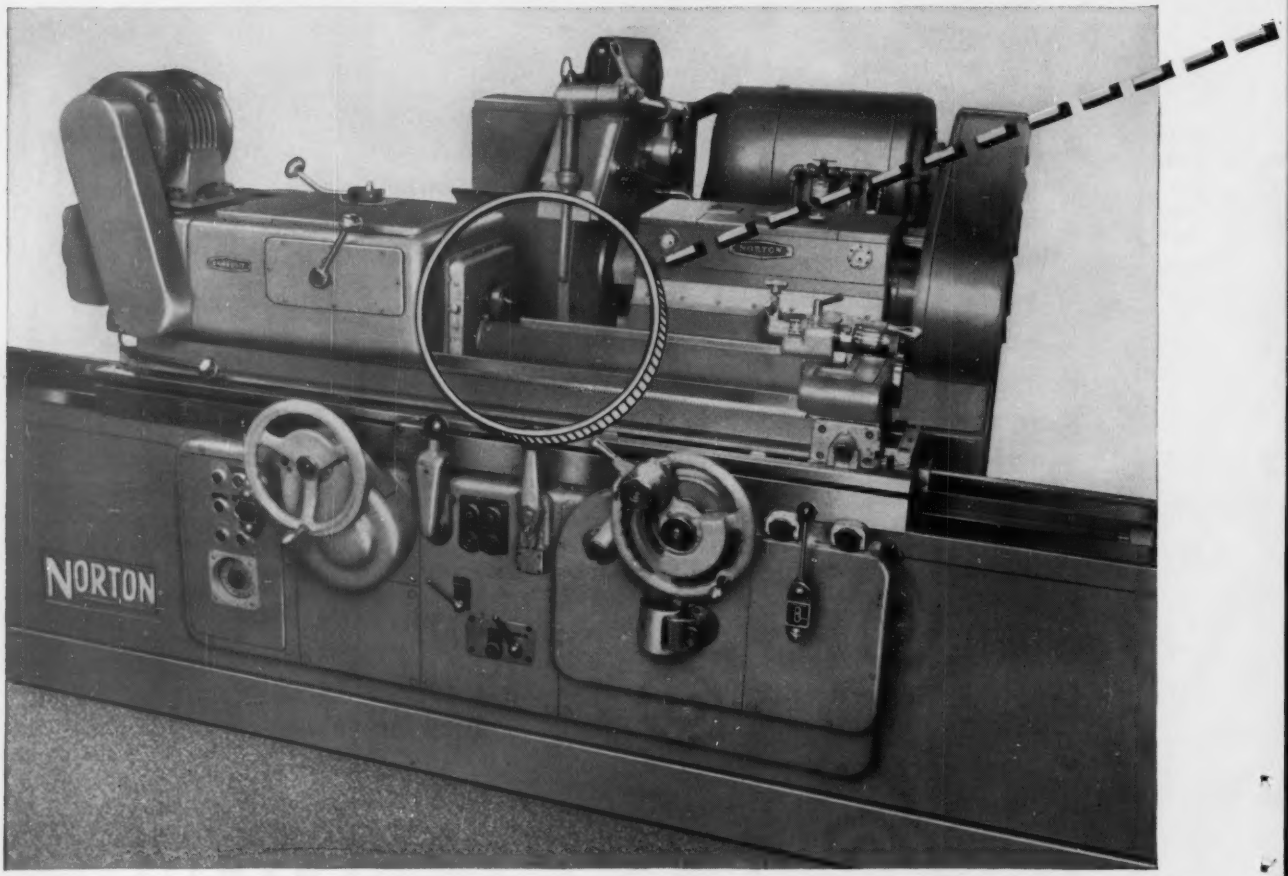
AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories



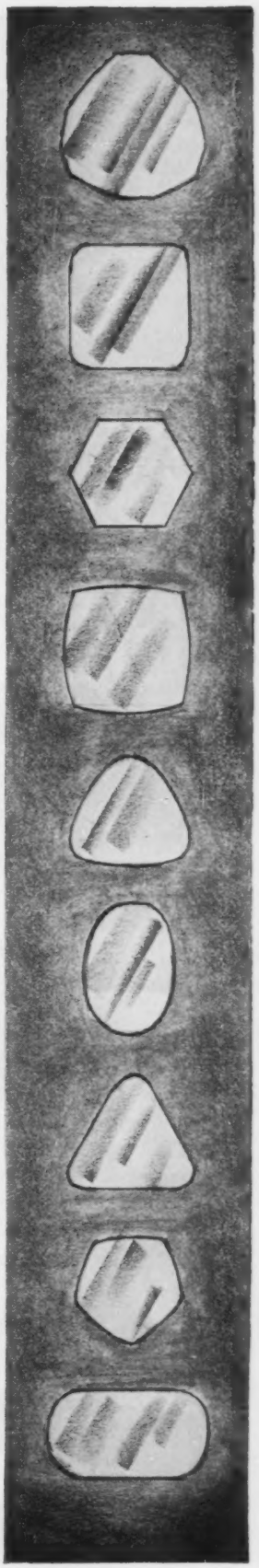
These representative types of tri-lobe shafts, shown with mating parts, are only a few of the many different shapes you can produce on Norton cam grinding equipment.



A Norton 5" x 24" Type CTU semiautomatic production Cam Grinder for maximum speed, economy and versatility.

For grinding drive shafts to any shape





Norton cam grinding equipment produces endless variations of triangular, square, oval or many-sided forms—accurately and economically

If you are now grinding tri-lobe or other forms of drive shafts, or are planning to grind such shafts, it will pay you to investigate Norton cam grinding equipment.

Norton Cam Grinders are available in varying work capacities. They are designed for rapidly grinding shafts to the exact form you need, to the tolerance you must hold, and with the fast, trouble-free operation that means lower production costs.

Shapes you can produce are not confined to arcs, but include curves and tangent flats in combination. Broaches for producing the mating holes can also be accurately ground on this same equipment.

Call on Norton cam engineers for expert help in the design and production of shaft forms that will best meet your needs. Or send for Catalog 2053, containing further facts on cam and shape grinding equipment. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

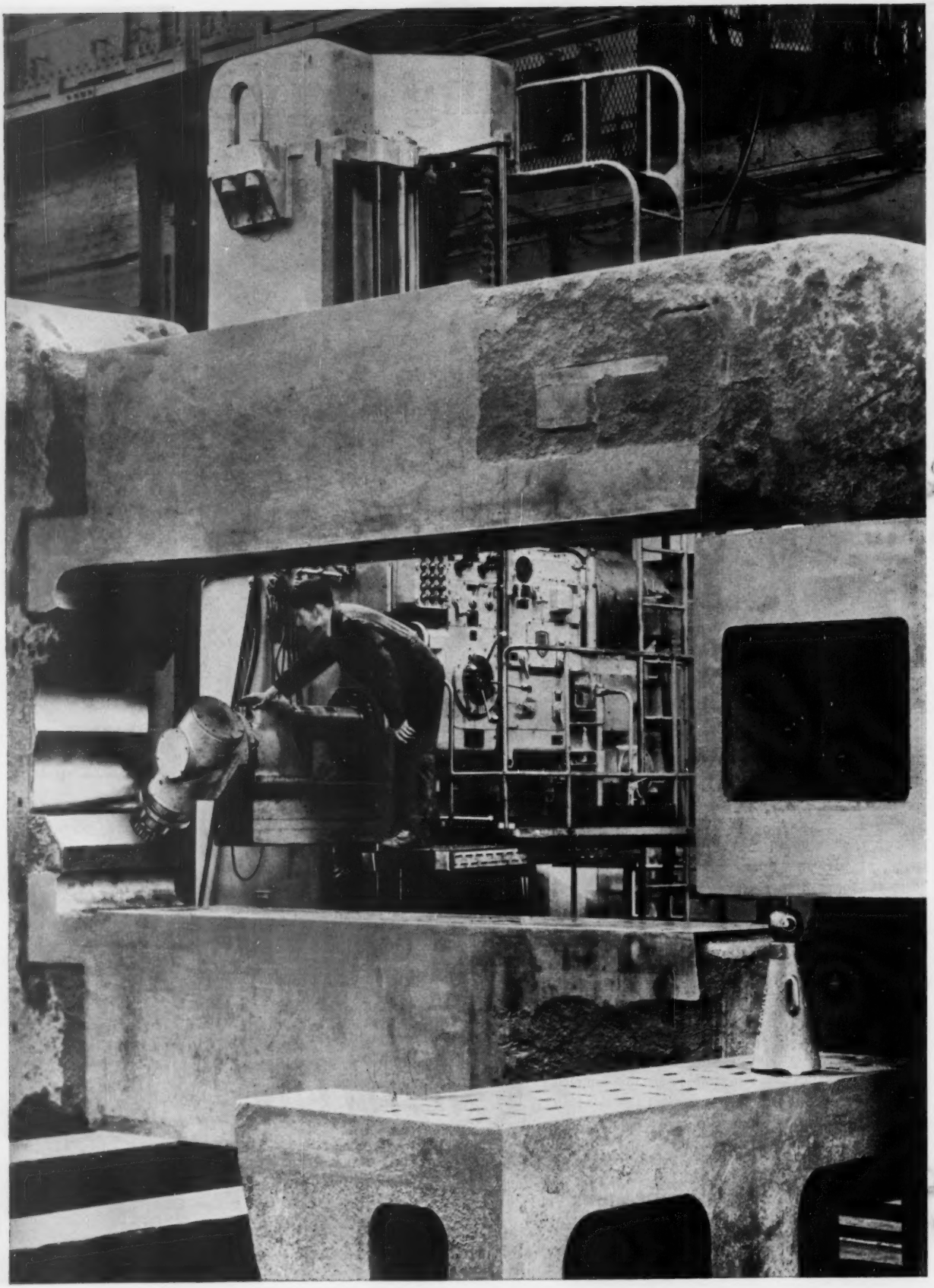
To Economize, Modernize With NEW

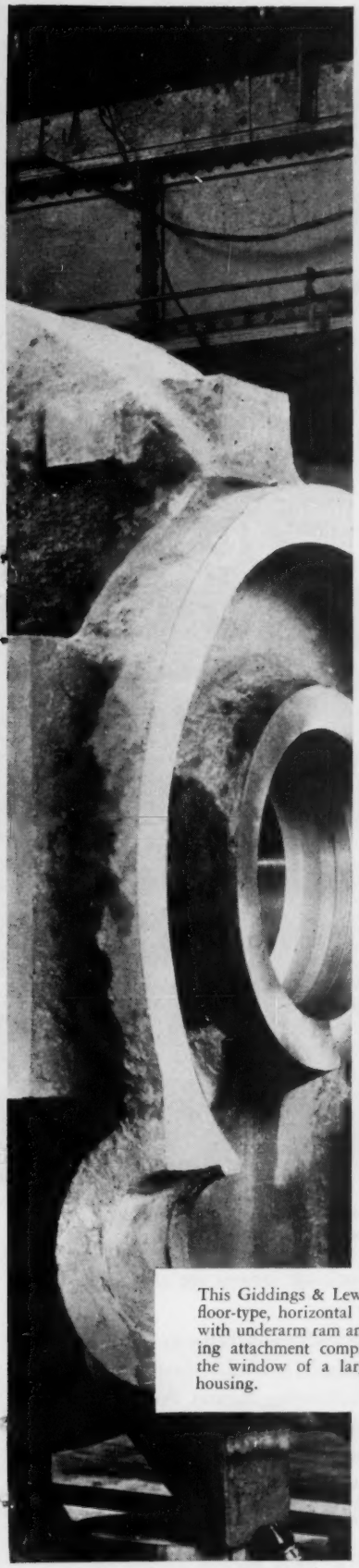
NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: Worcester • Hartford
New York • Cleveland • Chicago • Detroit





KING-SIZE

for bigger profits!

Giddings & Lewis floor-type, high-power, precision horizontal boring, drilling and milling machines are unmatched in accuracy and production capacity

Giant-size, cast-iron and steel castings with many surfaces — requiring any combination of precision milling, boring or drilling — can be bigger profit-makers when you machine them on Giddings & Lewis 50 Series horizontal boring machines.

You'll find it highly profitable to mill, face, turn and bore on these up-to-the-minute designed machines. Optional equipment permits even greater range of applications. Standard arrangements and attachments include—underarm spindle supports, angular or offset milling heads, tracer controlled contouring equipment and continuous feed facing heads.

In addition to bigger profits, you also benefit from higher standards of machining accuracy, more production, greater flexibility and versatility of operation.

For complete information on 50 Series, heavy-duty, horizontal boring, drilling and milling machines — in table, floor or planer types — contact your Giddings & Lewis representative or write for Catalog 50-F and Bulletin N-1 for underarm arrangement.

This Giddings & Lewis 7-in. spindle floor-type, horizontal boring machine with underarm ram and angular milling attachment completely machines the window of a large rolling mill housing.

GIDDINGS & LEWIS MACHINE TOOL CO.

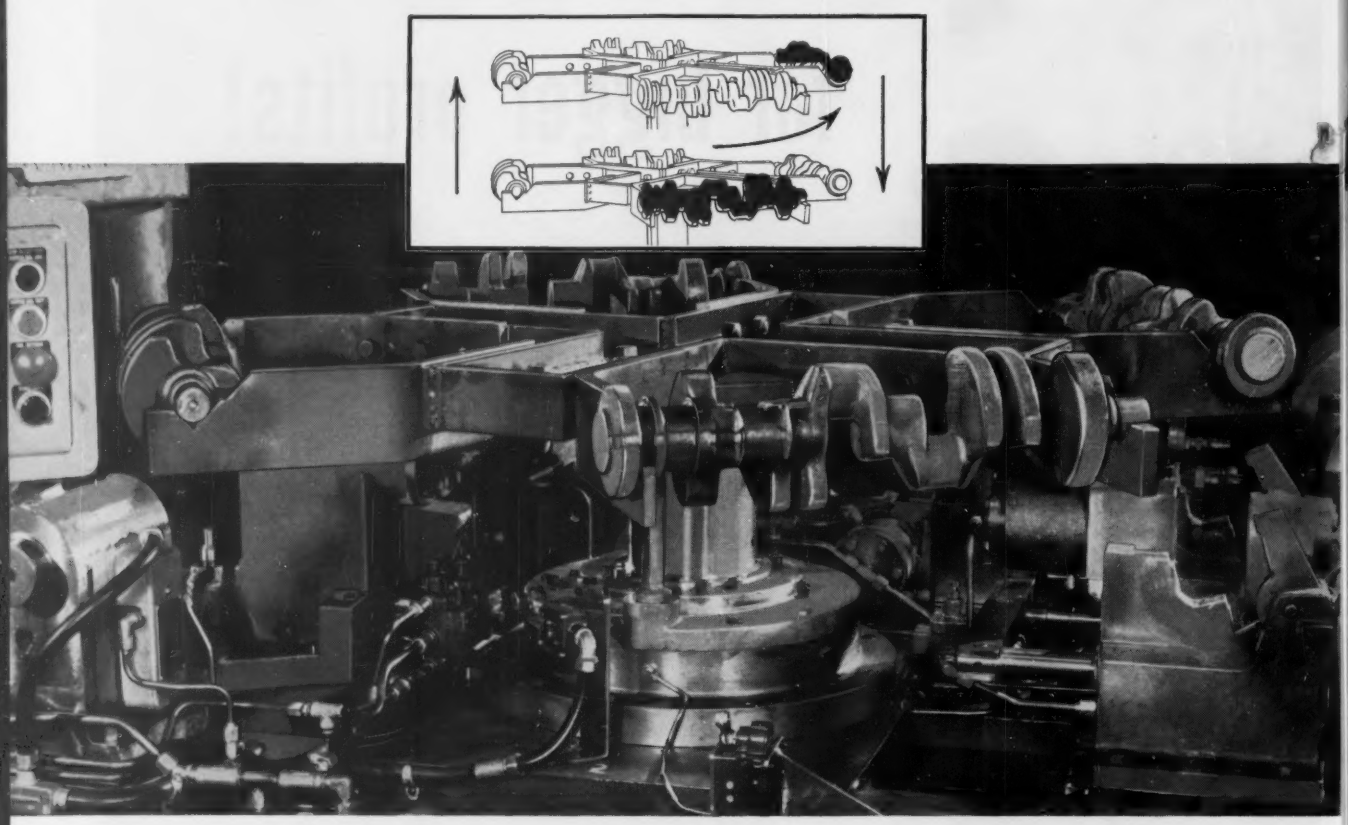
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools: Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools.

AUTOMATION TRENDS:

New rotary transfer design speeds milling, drilling and notching operations on crankshafts

Suggests new high-production possibilities for you



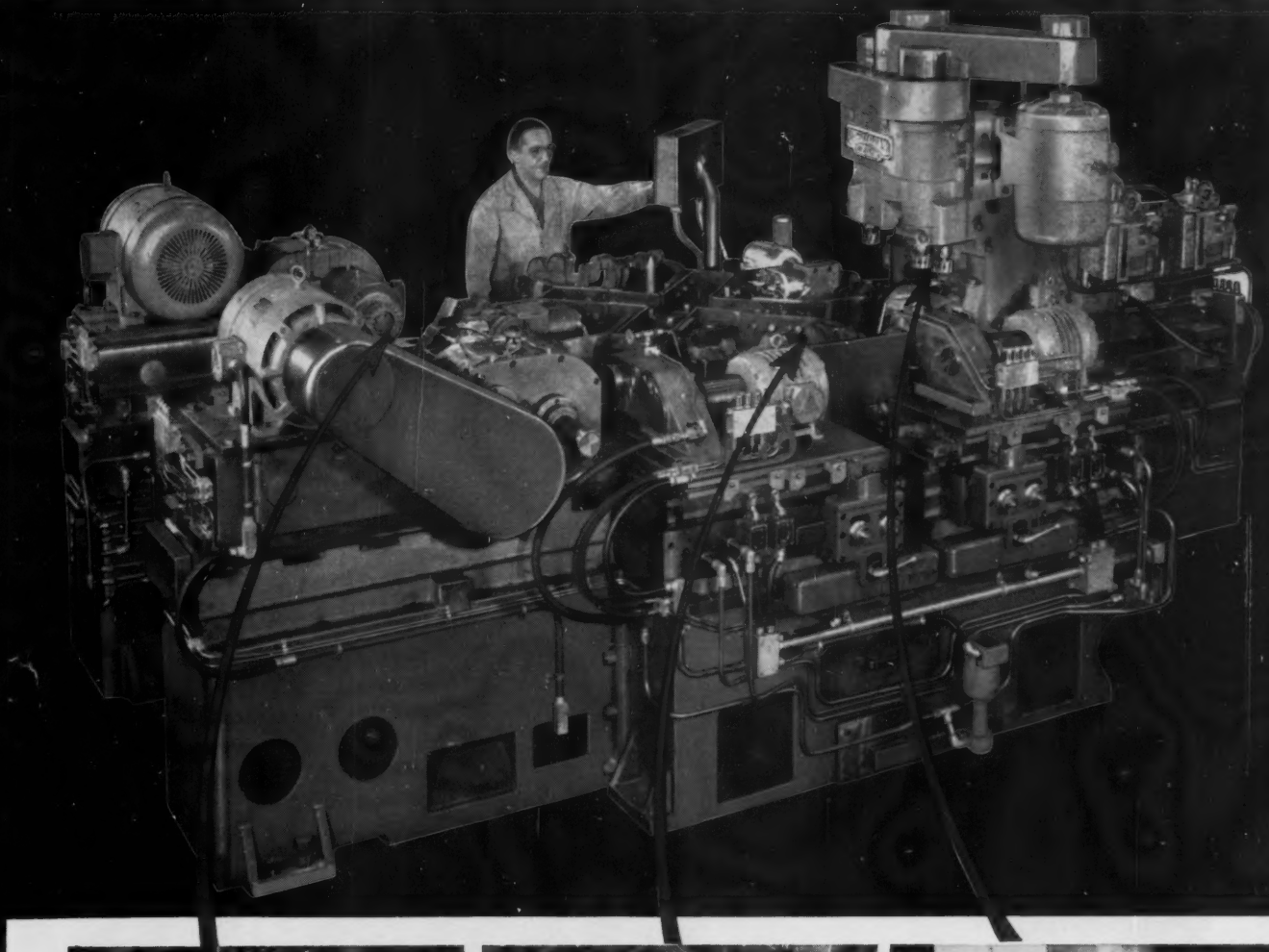
Hydraulic transfer unit of Kearney & Trecker's 4-Station Rotary Transfer machine is shown in raised position. Each of four arms carries one crankshaft. Diagram (above) illustrates vertical and rotational movement of transfer unit.

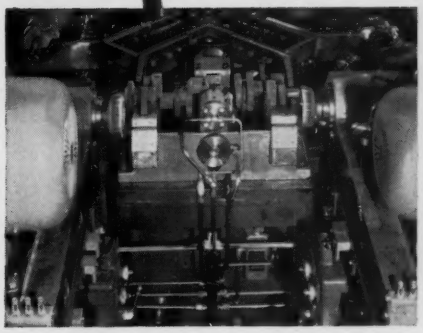
ANOTHER example of recent advances in production machine design is this Four-Station Rotary Transfer machine, shown at right, developed and built by Kearney & Trecker's Special Machinery Division. Engineered for high-speed production, the machine mills and center-drills the ends and mills the locating notches on automobile crankshafts. Production rate is 108 pieces per hour.

One of the outstanding design features incorporated in the machine is a special hydraulic rotary transfer mechanism which delivers the workpieces in sequence to machining stations where they are clamped by automatic fixtures. In addition, the machine comprises one drilling and two milling units all fastened to a common base. Three automatic hydraulic clamping and locating fixtures are also secured to the machine base.

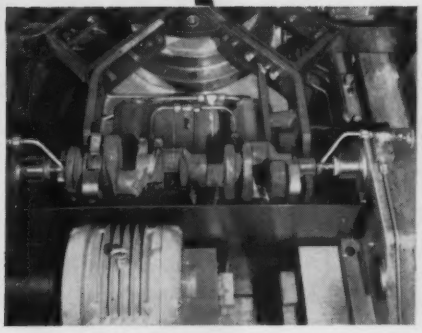
Here's how the rotary transfer unit helps to speed production. It raises four crankshafts at once... rotates and then lowers them into hydraulic clamping fixtures. Positive positioning is assured by a tapered rod mounted on the machine base which locates into one of four accurately drilled holes with inserted hardened bushings on the transfer unit base.

If you are faced with production problems that require special machinery — find out how Kearney & Trecker engineering and Special Machinery Division can serve you. Contact your Kearney & Trecker representative today.

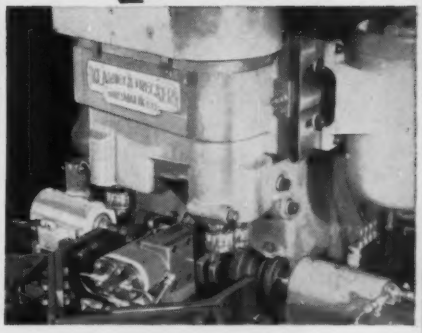




At the first machining station, crankshaft ends are milled to length by two horizontal spindles carrying 6-in. dia. cutters. Spindles are powered by 10-hp and 7½-hp motors.



Ample coolant is supplied to the third machining station where crankshaft ends are center-drilled. Each of the two horizontal spindles is powered by a ¾-hp motor.



Six-spindle head, mounted on positioning saddle, mills locating notches on crankshaft. Head advances to a positive stop, moves to left, completes operation and returns.



Special Machinery Division

MILWAUKEE 14, WIS., U.S.A.



KEARNEY & TRECKER CORPORATION
Special Machinery Division
6784 W. National Ave.
Milwaukee 14, Wisconsin

Please send me Data Sheet No. 1036 with details on Four-Station Rotary Transfer Machine. ☐ Check here if you would like to have a representative call on you as soon as possible (or call Milwaukee, GReenfield 6-8300)

Name.....

Title.....

Company.....

Address.....

City.....Zone.....State.....

Warner & Swasey's record

"ONLY ONE DAY'S DOWNTIME



THAT'S the report on two Warner & Swasey No. 3 Universal Turret Lathes at the Ralston, Nebraska, plant of Sensation Mower, Inc. And since their installation in 1946 these two highly versatile turret lathes have efficiently handled the entire metal turning requirements of the plant—over 40 different parts for mowers, snow removal equipment, and power floor polishers.

Mr. W. H. Phelps, Sensation Mower's President, says, "We are able to get the job done with these machines a lot faster than even your Field Engineer said we could."

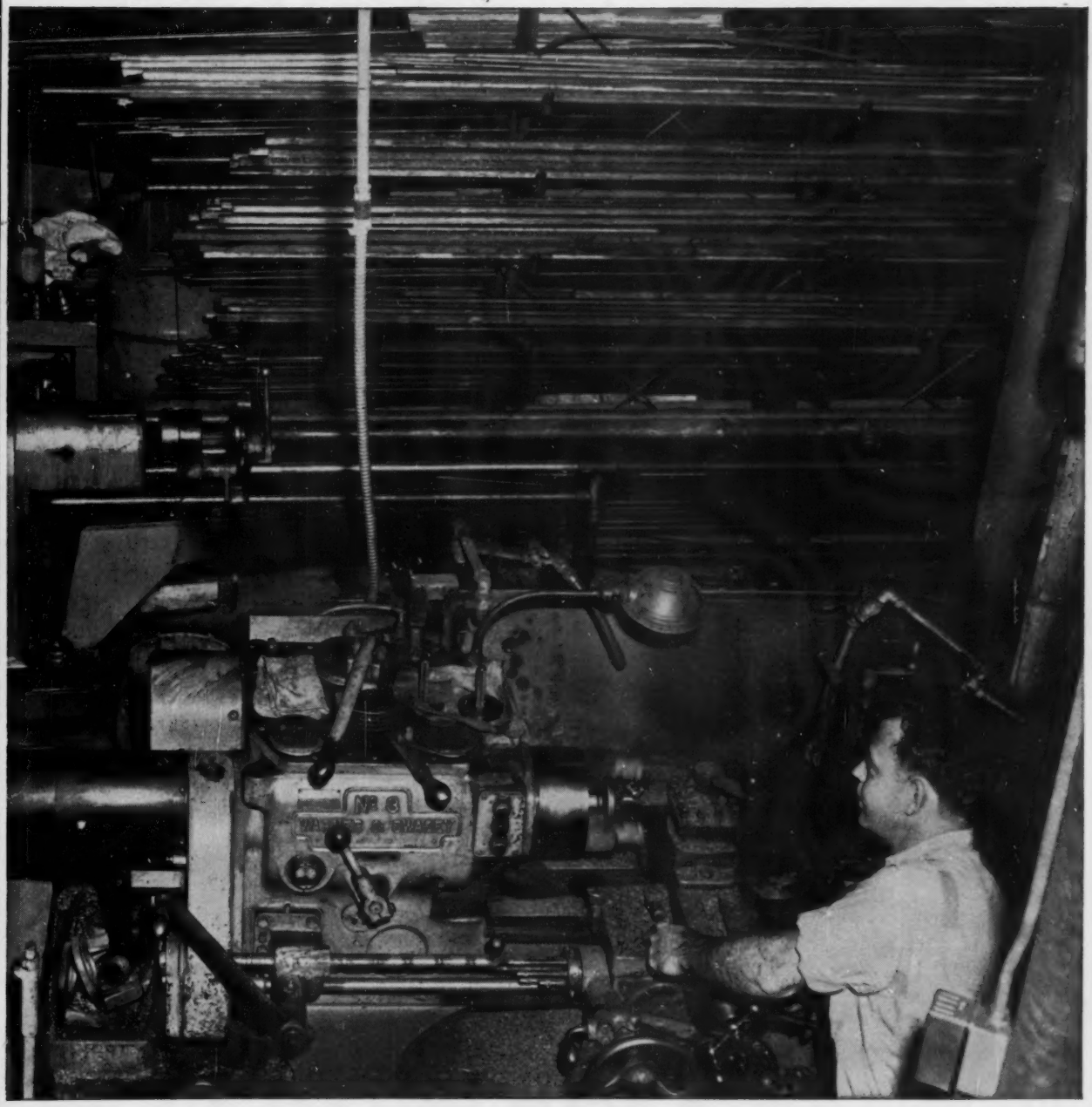
Yes, Warner & Swaseys are built to last—to give you dependable, high precision production with the very minimum of downtime and maintenance costs.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

at Sensation Mower, Inc.

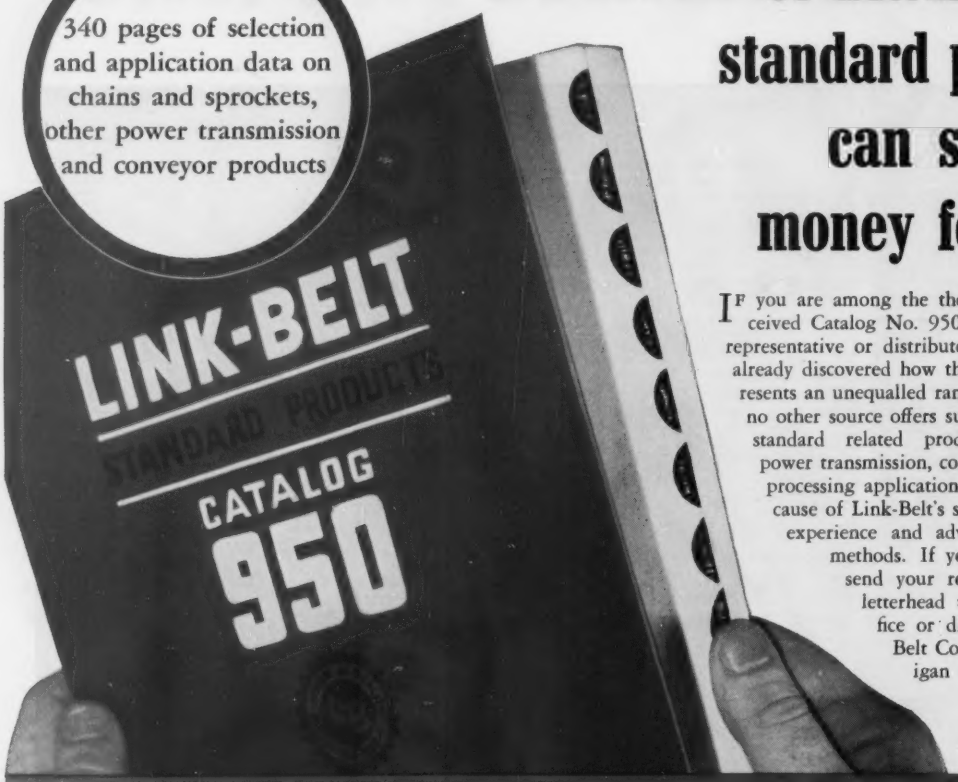
IN SEVEN YEARS!"



SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

How this NEW catalog of LINK-BELT standard products can save money for you

340 pages of selection and application data on chains and sprockets, other power transmission and conveyor products



IF you are among the thousands who have received Catalog No. 950 from your Link-Belt representative or distributor, chances are you've already discovered how this "encyclopedia" represents an unequalled range of choice—because no other source offers such a complete line of standard related products for mechanical power transmission, conveying, elevating and processing applications. You profit, too, because of Link-Belt's specialized engineering experience and advanced manufacturing methods. If you don't have a copy, send your request on your firm's letterhead to your Link-Belt office or distributor or to Link-Belt Company, 307 N. Michigan Ave., Chicago 1, Ill.

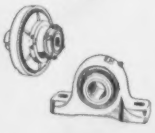
Here's a single, easy-to-use source for all these quality products



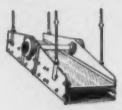
Chains—cast, combination, forged and steel sidebar and attachments, with arm or plate center cast sprockets. *Precision steel roller chains and sprockets. Silent chains and sprockets.* Castings, tighteners, wing and swivel attachments.



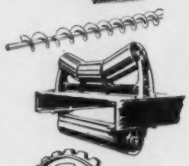
Enclosed drives—P.I.V. variable speed and fluid drives, gearmotors and motogears, parallel shaft and worm gear drives.



Bearings—ball, roller, babbitted and bronze. *Rigid and flexible couplings.* Take-ups, hangers, bushings, pulleys, gears, clutches, backstops, shear pin hubs, collars, grease cups.



Processing equipment—vibrating screens, icing equipment.



Conveyors—Flexmount oscillating and piano-hinged apron. *Components* for screw, belt and trolley conveyors. *Car spotters and pullers. Power unloading scoops. Bucket elevators and elevator buckets.*



Other products—cast and cut tooth sprocket wheels, taper lock bushings, spray nozzles, gates, cutoff valves, winches.

LINK-BELT

One source . . . one responsibility for materials handling and power transmission machinery

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,050

For more information on products advertised, use Inquiry Card, page 243

Gardner Cylinder Wheels

Give Maximum Safety . . . Lower Costs

***WIRE-LOKT*® Construction**

This exclusive Gardner feature assures maximum safety. A heavy steel mesh is securely embedded in the back of the abrasive.

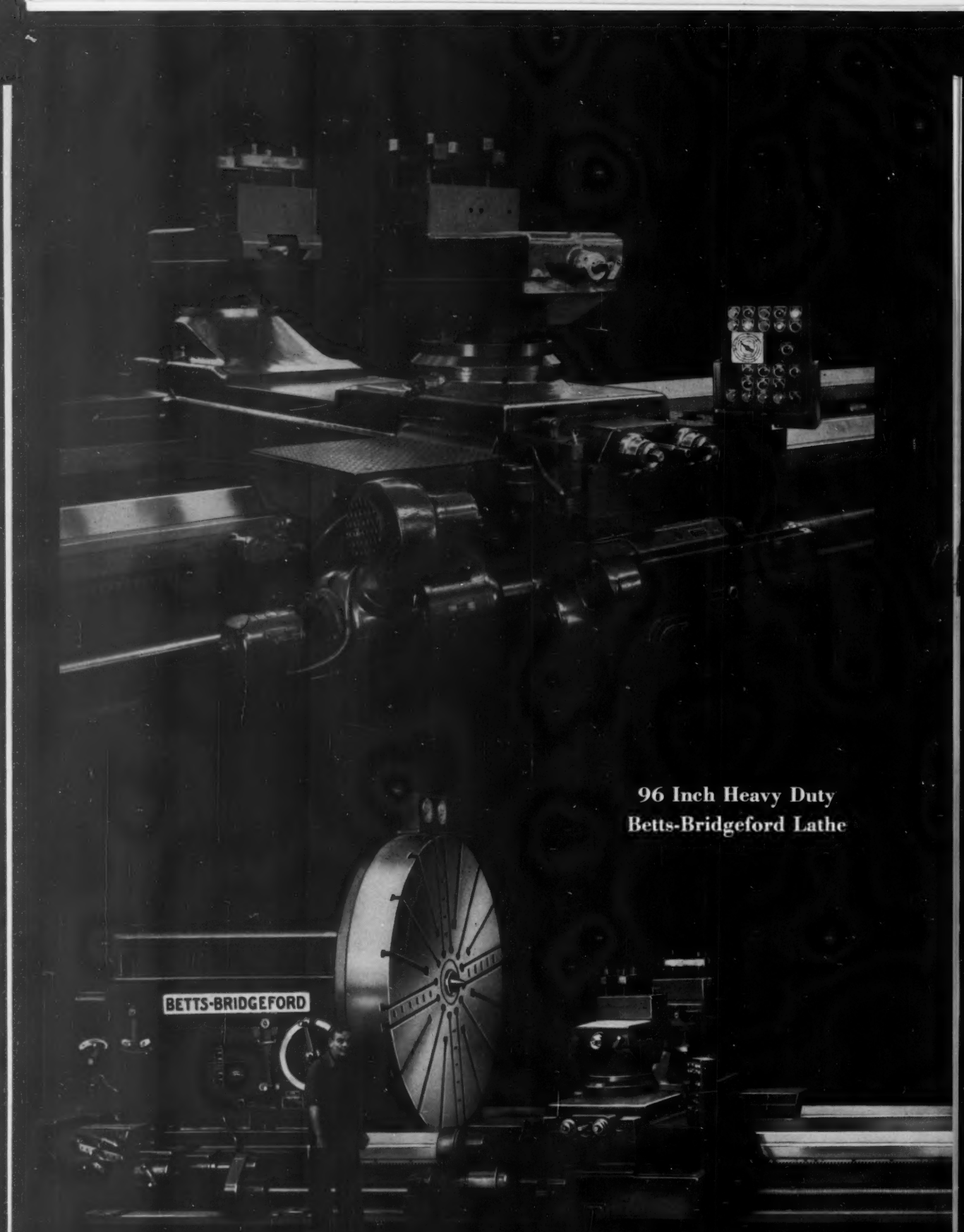


122A

GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER

abrasive discs



96 Inch Heavy Duty
Betts-Bridgeford Lathe

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

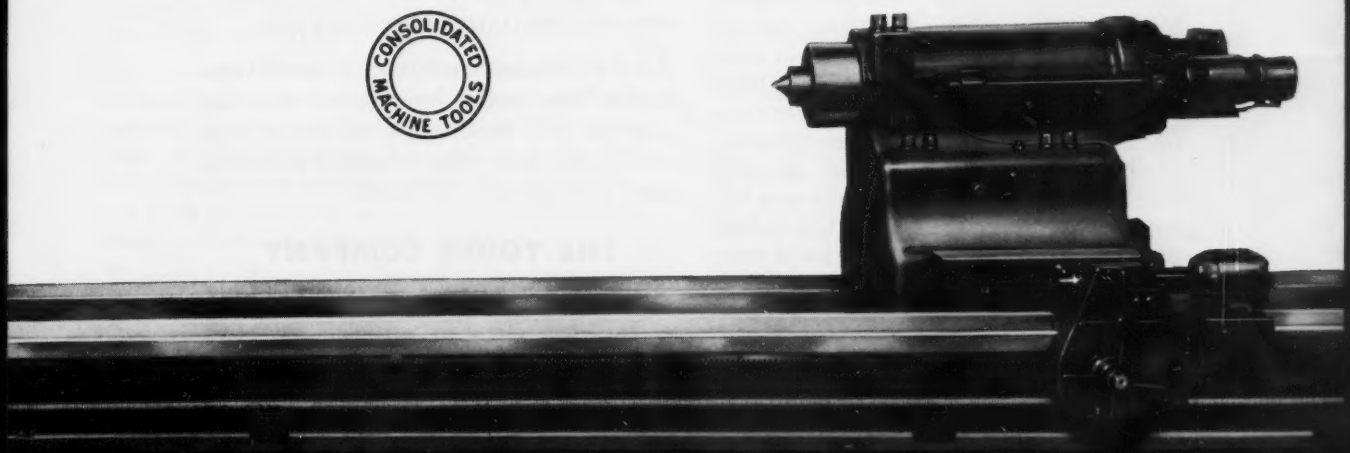
You Can Run This BETTS-BRIDGEFORD LATHE AT THE CUTTING TOOLS!

All of the feeds and all of the 20 to 1 range driving motor speeds are electronically selected and controlled at the cutting tools! Both are infinitely variable and can be changed in fine increments while the tools are cutting!

Push buttons on the control panel traverse the carriage right or left and the tools in or out.

Only for thread cutting or shifting in or out of the face plate drive, does the operator have to leave his working position at the cutting tools.

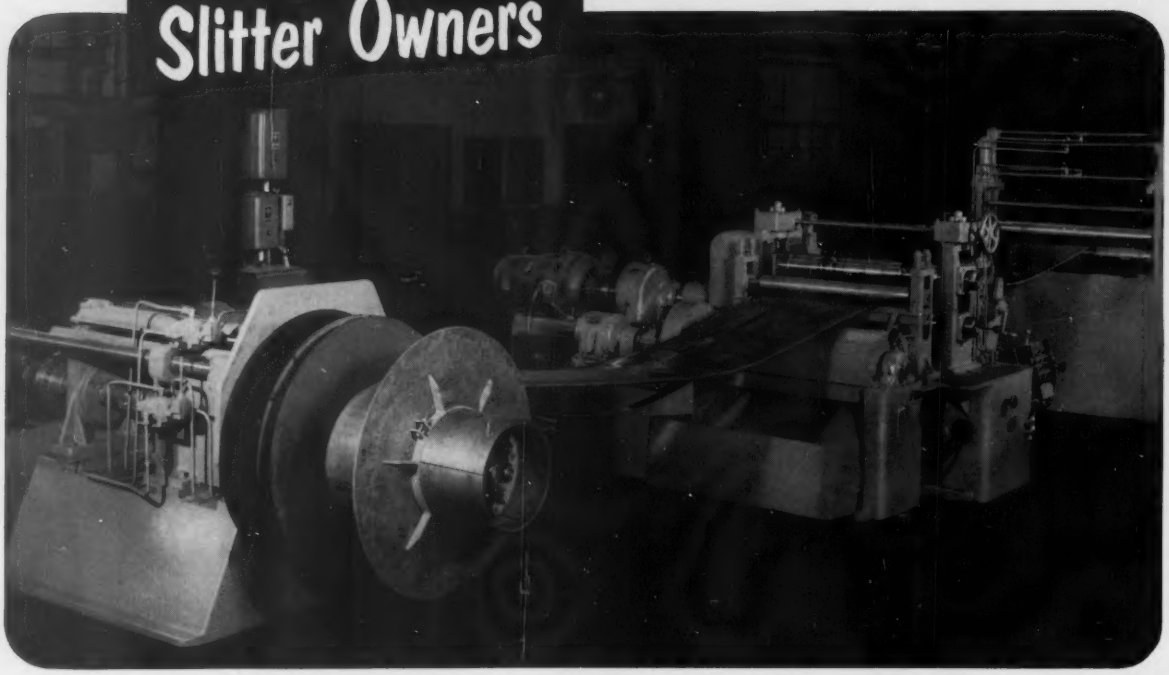
CONSOLIDATED MACHINE TOOLS



CORPORATION, ROCHESTER, N. Y.

Birmingham Company, Incorporated

Ask any number of Yoder Slitter Owners



how they like it, and you may get as many different answers, because the benefits are so many.

One manufacturer said: "Our strip inventories have been reduced by 60% and greatly simplified. Our requirements in slit strands can now be quickly met from a relatively small stock of mill-width coils." Another manufacturer remarked: "We no longer have to worry about ordering strip long in advance, complicating our production planning." A third manufacturer made this comment: "We can now buy our strip wherever we can get the best quality, price and delivery. That saves a lot of time, money and worry."

Any one of these and other benefits may in itself be sufficient to justify the investment; yet, quite aside from this, the *direct savings in slitting cost always repays the investment in a short time,* often in less than a year.

Ask for the Yoder Slitter Book. It contains cost studies, time studies, information on scrap disposal, coil handling, small versus large slitters, and many other subjects of interest to users of coiled strip and sheets.

THE YODER COMPANY
5504 Walworth Ave. • Cleveland 2, Ohio

Complete Production Lines

- ★ **COLD-ROLL-FORMING** and auxiliary machinery
- ★ **GANG SLITTING LINES** for Coils and Sheets
- ★ **PIPE and TUBE MILLS**—cold forming and welding

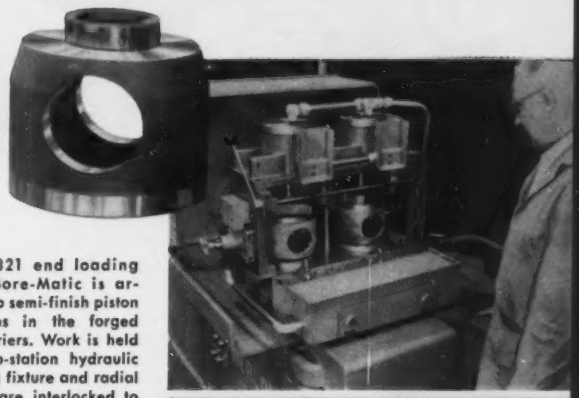
ENGINEERING YODER MANUFACTURING

For more information on these products, use Inquiry Card, page 243



10,000 TONS AT A MILE A MINUTE!

...it will get where it's going a little sooner, a little safer, because this part got the FULL HEALD TREATMENT



You're hitting the high iron at 60 per, with ten thousand tons of fast freight behind you. The huge, smoothly-purring diesels at your command have ample power and stamina to pull this tremendous load for hundreds of miles—with no interruptions, no unscheduled stops.

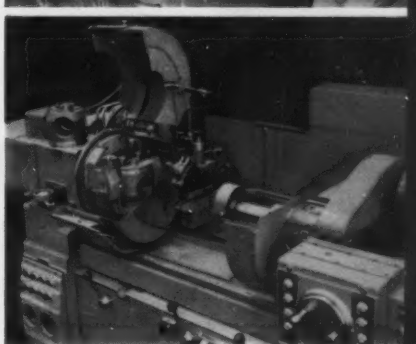
The tremendous power and long-haul dependability of modern diesel locomotives are a tribute to the skill and ingenuity of their makers. And precision finishing on Heald machines adds much to the stamina and perfect functioning of many vital diesel parts. Here, for example, is a piston pin carrier that is processed on *all three* basic Heald machines—as shown at the right.

Whenever a part is precision finished on Heald equipment you can be sure of three things. A finer, longer-lasting, precision made part. Important savings in time and production cost. A definite competitive advantage for your product. That's why IT PAYS TO COME TO HEALD.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



Model 321 end loading Heald Bore-Matic is arranged to semi-finish piston pin holes in the forged steel carriers. Work is held in a two-station hydraulic clamping fixture and radial locaters are interlocked to insure proper location before machine is started.

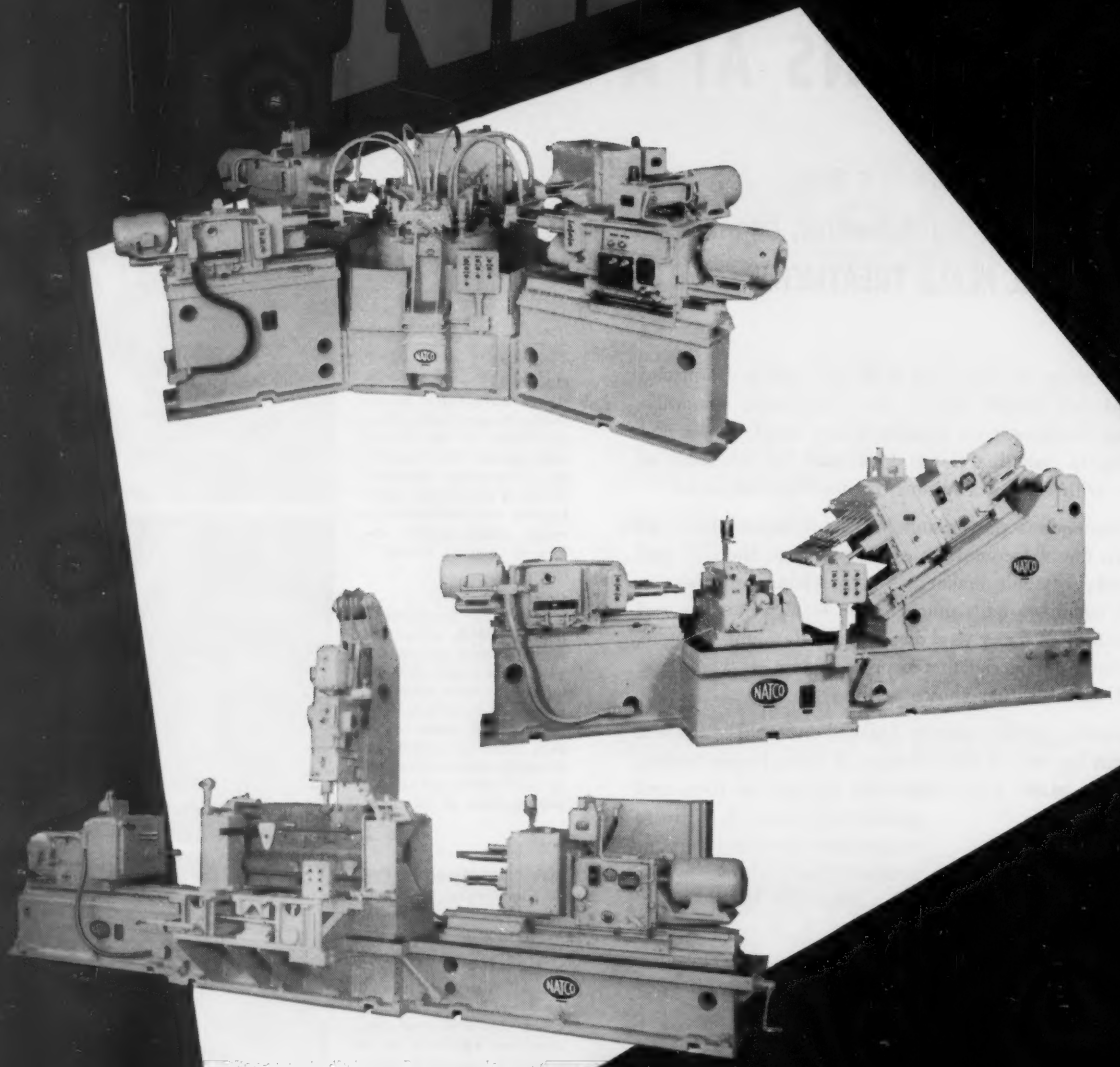


Model 272 Gage-Matic Internal finish grinds the piston carriers. The work is held in an angle plate fixture with hand clamping; location is by pins in locating holes in piston carrier skirt. Workhead spindle positioning units are furnished so that loading will be from one position at all times.

Model 261 Rotary Surface Grinder finishes the shoulder of the piston pin carrier to provide flat smooth surface for locating on the inside dome of the diesel piston. The work is held on a radial pole magnetic chuck with a retainer ring. Machine operates on a standard operating cycle.

BUILD YOUR OWN DRILLING, BORING, FACING and TAPPING MACHINES WITH...

NATCO



HOLEUNITS



Shown at left are a few representative machines that have been built from NATCO Holeunits. These standard, compact, self-contained hydraulic units are furnished in three sizes and may be arranged with any one of seven different horsepower capacities ranging from one and one-half to fifteen horsepower. They will operate at any angle and no connections other than electrical are required.



Call a Natco Field Engineer

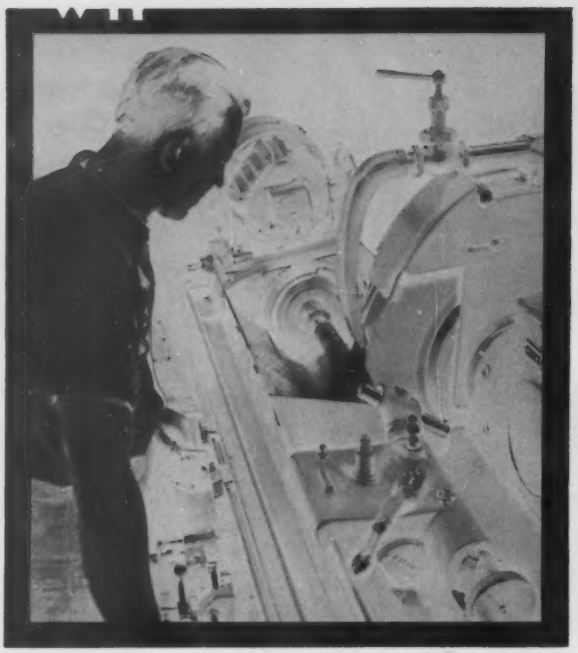
to help you solve your problems in
Drilling, Boring, Facing and Tapping

NATCO

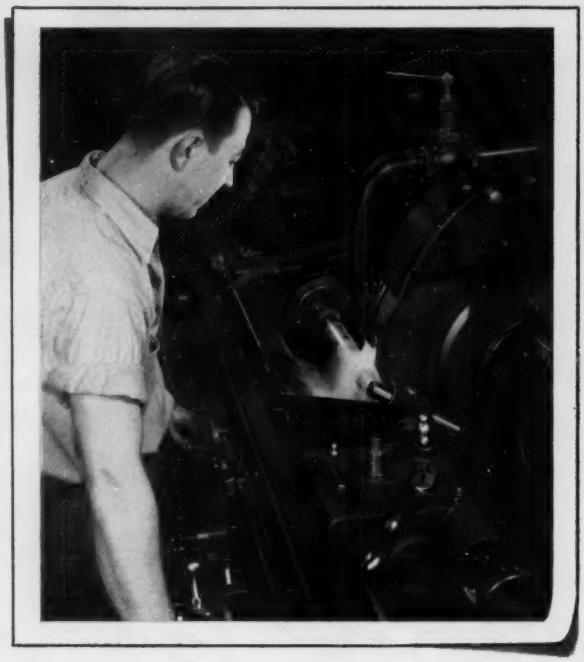
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

CHICAGO, Room 203, 6429 W. North Ave., Oak Park • DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon



Just as a photograph negative assures positive duplication...



NOW

Cincinnati Grinding Wheels offer

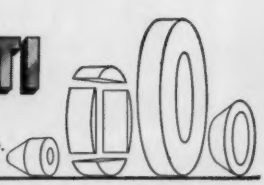
PD POSITIVE DUPLICATION

Here is an achievement in precision manufacturing and quality control that will save you money and increase your production. For the CINCINNATI (PD) Manufacturing Process assures a Positive Duplication of the original wheel *every* time you reorder.

"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind *exactly alike*. Yet they *are priced no higher than ordinary wheels.*

Let us prove to you how CINCINNATI (PD) WHEELS will make money for you. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or 'phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati, 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



For more information on products advertised, use Inquiry Card, page 243



First name in cutting fluids every season

You'll be reminded of cool fall breezes all year 'round when CIMCOOL° is on your broaching jobs. Because this radically new and different cutting fluid combines friction reduction and cooling capacity in a degree never before attained.

CIMCOOL reduces the distortion of the work piece because this revolutionary cutting fluid cools faster. The broaching tool also stays cool —even to the touch.

CIMCOOL is far superior to old-fashioned petroleum-based cutting fluids because it is a *chemical emulsion*. It replaces all water emulsions and all but a few highly compounded specialty oils.

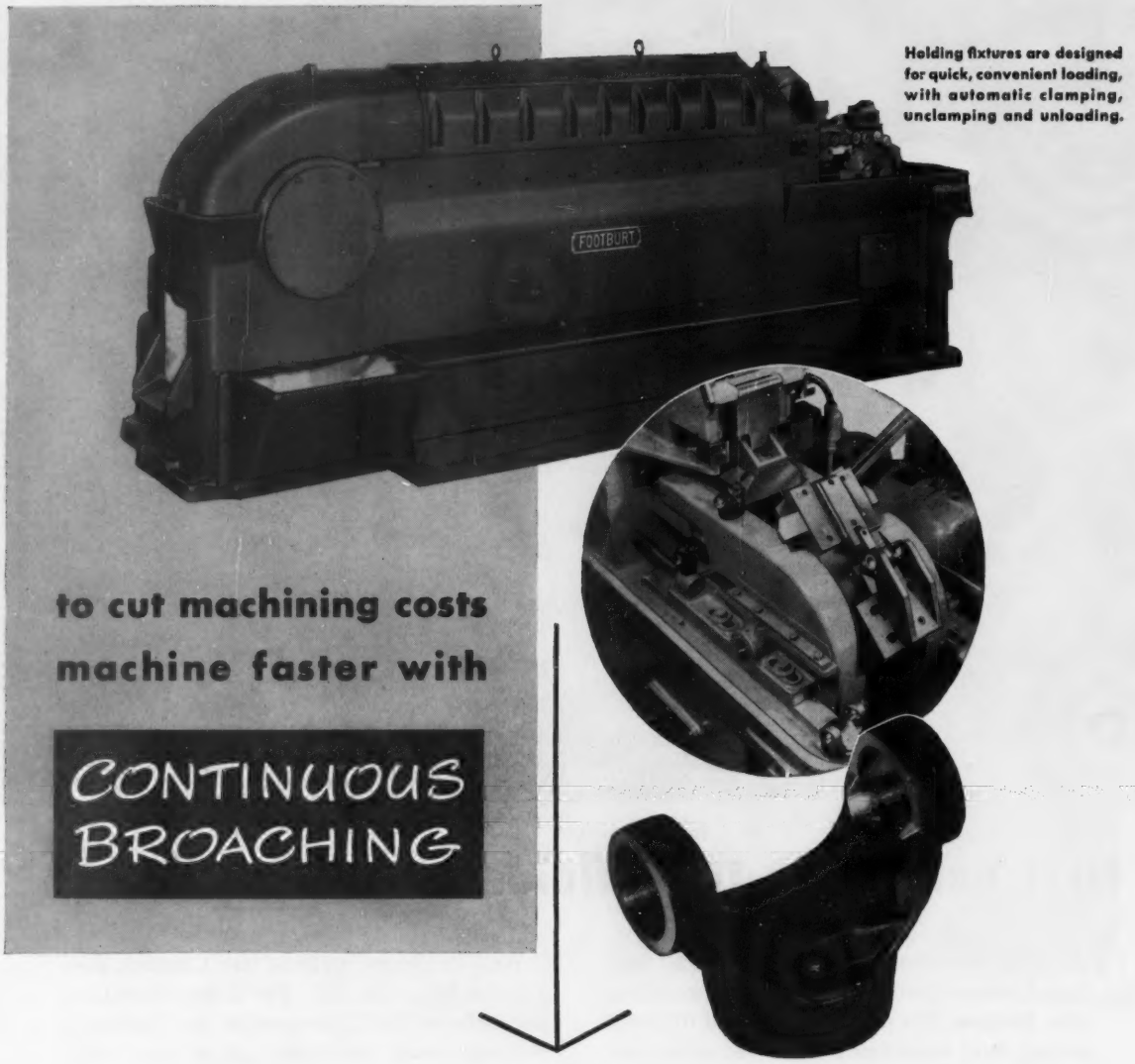
We'll be pleased to *prove* how CIMCOOL does a better broaching job. For a demonstration, just write us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Dept. M-104, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.



CIMCOOL for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



Holding fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.

to cut machining costs machine faster with

CONTINUOUS BROACHING

• Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

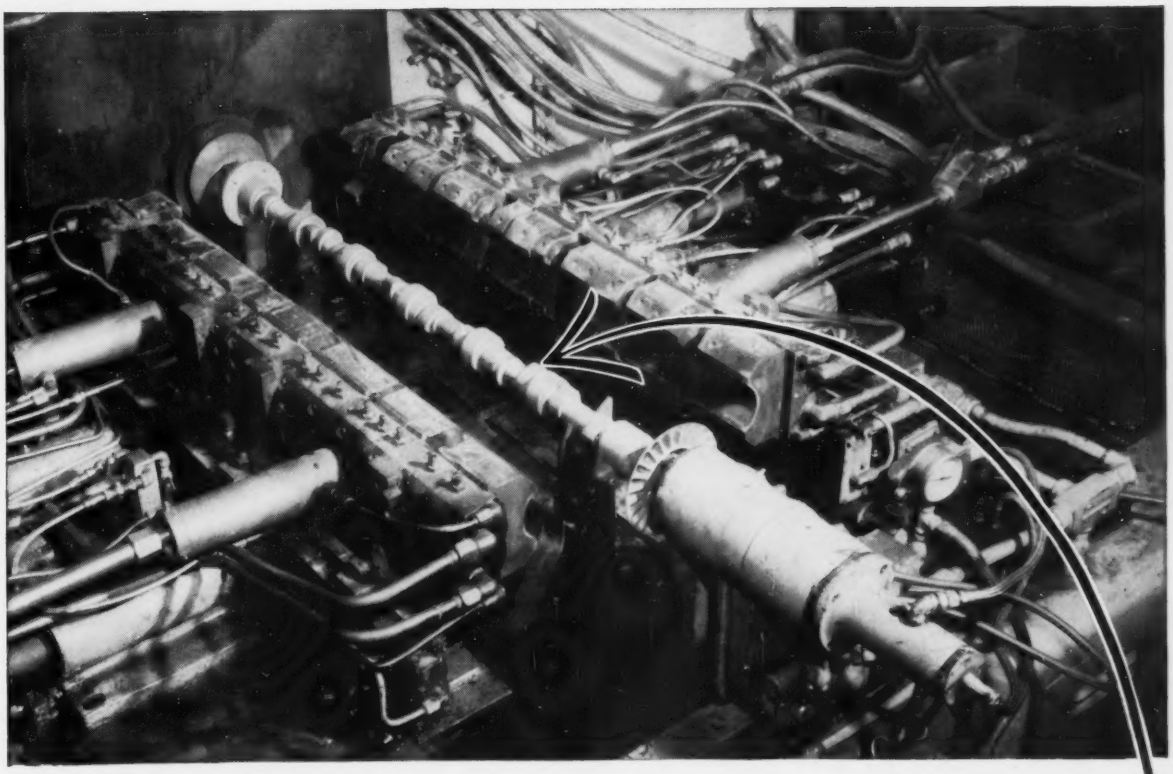
Detroit Office: General Motors Building

engineered for production

FOOTBURT

MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 243



Automatic Flame-Hardening Boosts Production 300%

Using an automatic oxy-acetylene flame-hardening machine, a leading manufacturer of trucks and marine equipment increased the production of flame-hardened gears, bearings, and camshafts 300 per cent. Parts are flame-hardened on as many as 22 different surfaces in fast, simple operations.

The flame-hardening process produces wear-resistant surfaces on large and small sections without heating the entire part . . . Distortion is at a minimum, and case depth is easily and accurately controlled. Flame-hardening is fast and relatively simple compared with other methods of hardening metal such as nitriding and carburizing. Low cost, portable flame-hardening equipment is available for the majority of applications.

Your local LINDE representative will be glad to show you how to produce machine parts with a tough, ductile interior and a hard, wear-resistant surface. Start saving now, call him for more information on flame-hardening.



A cross-section view of this camshaft shows an even, uniform depth of the hardened surface.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

"Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

For more information on products advertised, use Inquiry Card, page 243



Fall Foliage "The Color Line" FPG Photo

BULLARD

The Invisible Background of Industrial Progress

It is often said that the best things in life are free. Certainly the scenic joys provided by Mother Nature defy the greatest talents of man. Nothing is more awe-inspiring than a drive or trip over the highways and byways of our great land in the fall when Nature is in her fullest splendor. This is a privilege within the grasp of everyone.

Manufacturers of transportation equipment such as automobiles, busses and railroad locomotives and cars; and manufacturers of road-building equipment including trucks, bulldozers, road rollers, road scrapers and mechanical shovels have recognized that Bullard *Modern Machine Tools* are efficient manufacturing units — the ultimate in their field — another example of "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY · BRIDGEPORT 2, CONNECTICUT



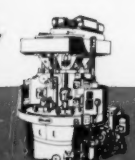
Bullard Contin-U-Matic

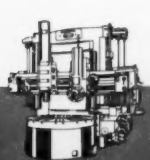
Type "RD" with 4–6 and 12 Spindles in 10"–14"–20"

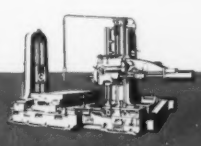
Do you need increased production? Do you want to lower your costs? Then investigate the advantages of a Bullard Contin-U-Matic.

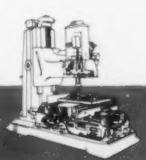
A case study of one of our customers reflects how a Bullard Contin-U-Matic provided the answer to their problem. Production on a reverse ring gear as previously machined was 38 pieces per hour. With a slight change in the holding fixture and tooling, the Contin-U-Matic method showed a great production increase over the former boring machine method. The customer is now machining 122 pieces per hour at 75% efficiency — *a productive increase of better than 220% over the previous type of equipment.*

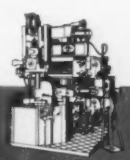
We invite you to avail yourself of Bullard Engineering Service by calling your local Bullard Sales Office or writing to The Bullard Company, Bridgeport 2, Connecticut — phone EDison 6-2511.

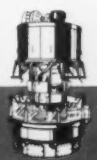

CONTIN-U-MATIC


CUT MASTER


HORIZONTAL BORING


SPACER


MAN-AU-TROL


MULT-AU-MATIC

BULLARD



New lightweight grinder is a HEAVYWEIGHT WORKER!



Why weigh down an operator with a heavier grinder? Put a new 7 pound air-powered CP Vertical Grinder in his hands and he'll remove the same amount of metal as he formerly did with a 10 pound tool!

Designed for driving cup wire brushes and grinding wheels, sanding discs, and cut-off wheels, the CP-3190 is tops for its handling ease and versatility. The features below explain why the CP-3190 takes the constant beating of heavy industrial usage with minimum maintenance:

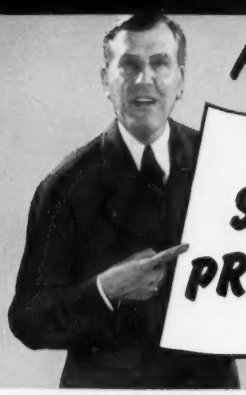
- **Splined type floating rotor to prevent end-plate wear from wheel thrust.**
- **Continuous lubrication is afforded by large oil reservoir and built-in lubricator.**
- **Safety governor valve cuts off air supply in the event of possible governor failure.**

Available in speeds up to 8000 RPM and in capacities capable of handling 6″ cup wheels, and 7″ and 9″ disc sanding pads and cut-off wheels. For more information write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

For more information on products advertised, use Inquiry Card, page 243



Precision Holding SPECIAL NEW PRODUCT EDITION

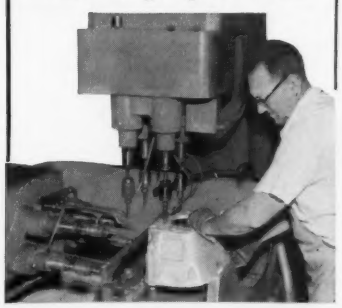
SCULLY JONES

NEWS

Published by Scully-Jones and Company
1901 South Rockwell Street, Chicago 8, Illinois

New Scully-Jones "Keyhole" Tool Ejector simplifies and speeds tool changes... makes machine accuracy last longer!

New Safe-Torque Tap Driver solves breakage problem



You saw it at the Tool Show in Philadelphia. It's a great new, adjustable torque, releasing driver for taps. Scully-Jones Safe-Torque Drivers are rapidly being adopted by tap users throughout the country. Reports show increase in tap life as high as 500%.

On the Buhr two-way tapping machine illustrated, for example, breakage is practically nonexistent after a year's operation, driving four 5/16-18 and four 7/16-14 taps for Class 2 holes in aluminum.

Other benefits reported include: increased over-all production; greater percentage of uniform, accurate threads; reduced scrap and rework on pieceparts; dependable operation; and closer, automatic control over tool wear.

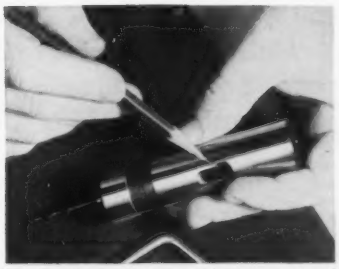


Investigate this job-proved method for controlling adverse machining conditions, such as hard spots, poor chip removal, inadequate cooling or lubrication, and improper sharpening of taps. Write for Bulletin No. 14-50.

Prevents damage to bearings and spindles often caused by hammering



This new tool ejection system makes obsolete conventional methods of removing tools from holders and spindles by hammering. Damage to bearings and spindles may now be stopped because Scully-Jones "Keyhole" Tool Ejectors literally *push* tools and adapters out of the spindle. There are no axial stresses or shocking blows to break tools and spring spindles. Ejection is faster and easier. Stationary mounted in presetting gage plates, they're the ideal method for making tool changes with a minimum of operator effort. So, look for "Keyhole" slots in the new Scully-Jones Tools you buy. Write for details in Bulletin No. 14-50.



"Keyhole" slots will accommodate conventional drift keys as well as the new tool ejector.



Powerful force is exerted directly in back of the tool by turning the cam-shaped ejector.

"Keyhole" slots are now standard on adjustable adapters, sleeves and sockets, quick-change chuck collets, turret tool holders, and counterbore drivers manufactured by Scully-Jones.



New Scully-Jones Floating Holder provides trouble-free collet action... reduces down-time and damage to cutting tools



Style "JT" Floating Holders are available with adjustable adapter shanks for multiple-spindle machines, straight shanks for turret lathes and screw machines, and ASA or Morse taper shanks for machines having tapered spindles.

Short-coupled and compact, it answers all the needs of multiple-spindle tapping and reaming. The new "JT" Floating Holder provides *true float* . . . absolutely no "dead spots" or binding because its double-gear spline drive principle permits freedom of movement *in all directions.*

In addition, it gives you faster, easier ejection of tools, and improved collet action. The new split collet compresses evenly and powerfully on the shank of the cutting tool. Even in a close cluster of spindles, the new "lock and eject" chuck makes tool changes fast and easy. Operator merely turns the threaded nut on the nose of the holder to seat and unseat the chuck. The nut revolves freely on ball bearings and stays on the holder—eliminates the use of conventional drifts.

Guard against production of bell-mouthed, out-of-round, and poorly finished reamed holes. Control oversized and tapered threads, tap life, and downtime on multiple-spindle operations with this great new floating holder. It's the only holder today having separate *floating* and *driving* elements—a basic essential for true floating action. Available with or without centering pin in range of sizes and styles. Write for authoritative analysis of misalignment problems and solutions: "What to look for when selecting floating holders." (PRECISION HOLDING NEWS, Volume 1, No. 2.)

There's a correct Scully-Jones Floating Holder for every job



Four complete lines of Scully-Jones Floating Holders—all utilizing the exclusive double-gear spline drive principle—give you a *free-floating* holder for every job. Style "JAS," shown above, is for straight shank drills and reamers—available with straight, taper, or adapter shank.



Threaded nut on nose of holder turns freely on ball bearings, drawing threaded chuck into tapered seat.



Chuck and cutting tool may be ejected separately or together by reversing rotation of the threaded nut.



Style "JA"—where overhang is no problem.

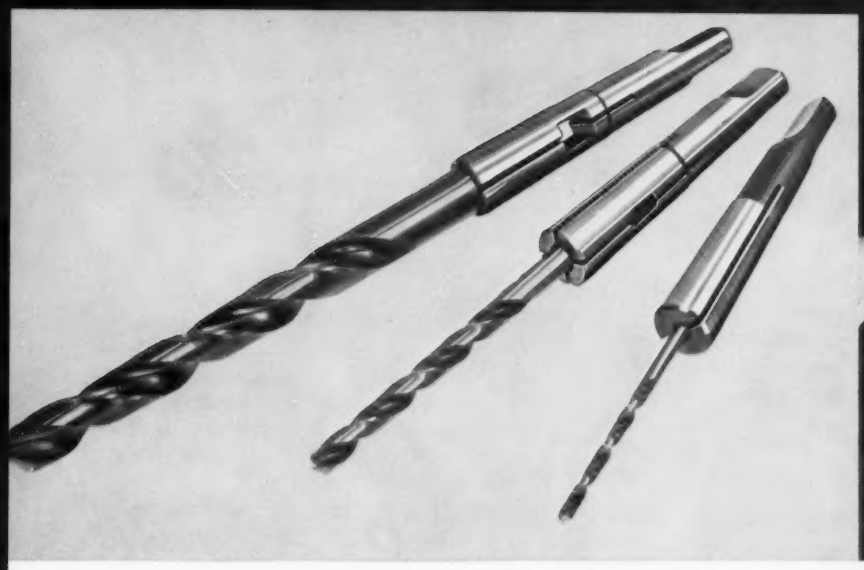


New Style "JS"—for automatic screw machines and lathes

New Tension and Compression Tap Holders have timesaver "Lock and Eject" Chuck

Improved design features quick, easy tool change without excessive torsion when locking taps in place . . . plus longer stroke, and wider range of application. Utilizing the same "lock and eject" collet design described above for floating holders, the new Scully-Jones Tension and Compression Tap Holders answer the need for reduced downtime and improved control over tooling problems on multiple-spindle machines.

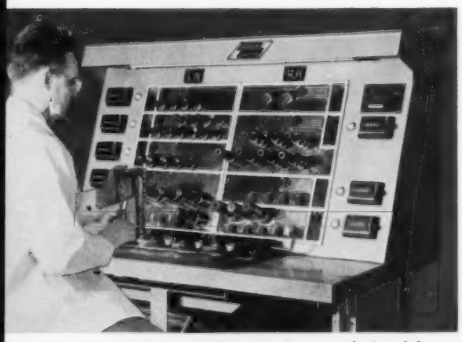
Each size holder may now be used for a wider range of tap sizes. They eliminate the need for lead screw tapping in many operations because spring action compensates for variations of feed between spindle and tap. Permit use of various pitch taps without costly feed changes. Safeguard spindle and tap when previous operation fails to provide a drilled hole. Permit accurate hand feed tapping, and quick, easy depth adjustments on multiple-spindle setups. Give you positive drive and more accurate trouble-free collet action. Write for Bulletin No. 4-50.





New TOOLITROL speeds setup and tool changes

The new Scully-Jones TOOLITROL minimizes downtime and keeps production at near capacity for all types of multiple-spindle operations. Engineered to the job,



All tools, holders, counters, and signal lamps are arranged in attractively finished steel cabinet and keyed to machine stations, giving operator complete control over tooling problems.

it pays for itself quickly in reduced tool breakage, increased production, and longer tool life.

TOOLITROL eliminates cut-and-try methods for setting and adjusting tools. Co-ordinates at-the-machine problems of presetting, storing, and changing tools. Automatic counters, with or without signal lights, control tool change periods. Applying *human engineering* to shop problems, TOOLITROL eliminates fatigue and prevents costly errors. Standard flush pin and height gages with gage plate, plus the broad line of Scully-Jones "Precision Holding" Tools, give you a completely packaged tool control method. Write for Bulletin 19-50.

New Scully-Jones Drill and Tap Chucks give greater resistance to pull-out . . . improved seating and collet action!

Here's a new twist in drill chuck design that offers many benefits to users and manufacturers of drilling machines. Scully-Jones has discovered how to increase resistance to pull-out, improve seating and collet action, and, in many cases, provide more accurate, concentric chucking. These new Scully-Jones Drill Chucks give you all the advantages of small diameter. Yet, improved 4-slot design provides greater protection against tool breakage and production shutdowns—added assurance that your drills will run true.

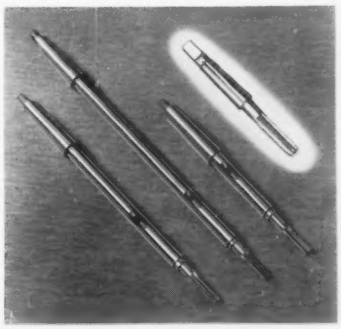
The new 4-slot design is now standard on all sizes *⅛" and larger*, having normal wall thickness. If chuck wall is thin, design has two short slots and two full-length slots, giving you the same improved chucking with maximum torsional strength. All chucks *up to ⅛"* require conventional 2-slot construction.

All Scully-Jones Drill Chucks are built to withstand heavy punishment, hardened to resist nicking and burring, and designed to outlast many drills.

Check table below for test results showing increased resistance to pull-out provided by this new Scully-Jones Chuck design. Write for Bulletin No. 1-50.

PULL-OUT TEST

Type of Drill Chuck	3/16"	1/4"	23/64"
Two slots	300#	500#	500#
Four slots	1200#	1500#	1400#



New Close Center Drivers use improved Tap Chuck

These new close center drivers provide greatly increased torsional strength and resistance to pull-out, plus improved seating and collet action. Improved chucks are easier to insert and eject from the drivers, have a broached square for positive drive, and are built sturdier for longer life. Each driver accommodates a range of tap chucks. Start saving now by converting to these improved Scully-Jones Drivers. Write for Bulletin No. 4-50.

SCULLY JONES

Precision Holding News

Scully-Jones expands to give you faster service on powerful and accurate "Roll-Lock" Chucking Tools



Unique operating principle provides accurate, centering shrink fit for chucking parts and tools

No more waiting for overseas shipments or delayed service! With industry acceptance of these great new chucking tools "snowballing" throughout the country, Scully-Jones has added to its plant and facilities, and is now in full production on standard and special "Roll-Lock" Mandrels, Chucks, and Arbors.

The exclusive advantages of "Roll-Lock" tools have been successfully applied for *work* and *tool* holding on countless machining operations, as well as on inspection and gaging equipment. Wherever extreme accuracy and speed of handling are factors, "Roll-Locks" may be the answer to your machining problems. They're a simple and quick method for chucking to a shrink fit, eliminating the drudgery and accessory tools required by conventional methods.

Rigid, powerful holding action of "Roll-Lock" tools permits transmission of torque and thrust necessary for today's fast metal removal. Accurate chucking . . . often within .0001" TIR . . . assures finer finish and fewer rejects. They're a simple, accurate method for locating and chucking pieceparts faster. Actuation and release are simple, too, because operator merely twists the actuating ring or cone (only rolling friction must be overcome) to operate the tool.

Ask your nearby Scully-Jones representative or stocking distributor for recommendations on the use of "Roll-Lock" Chucking Tools for a variety of operations. For complete description of standard and special "Roll-Lock" tools, write for Bulletin No. 17-50.

Standard Flange Type Chuck—turning outside shell (actuating ring) quickly compresses wall of the chuck body evenly along chucking surface, creating a powerful shrink fit.



Flange Type Expanding Arbor—turning actuating cone easily expands wall of arbor body evenly along the chucking surface, eliminating all clearance or play.



Expanding Mandrels—operation is similar to that of expanding arbor, left. Offer unusual accuracy and reduce handling time for testing and measuring operations.



SCULLY JONES

NEED MORE INFORMATION? Call your nearby Scully-Jones representative or stocking distributor—factory-trained precision tool and work holding "specialist"—for information and fast service. To receive "Precision Holding" News regularly, send name, title, and company affiliation.

Scully-Jones and Company

1901 S. ROCKWELL ST., CHICAGO 8, ILLINOIS • PHONE BISHOP 7-5900

Form No. 14-54

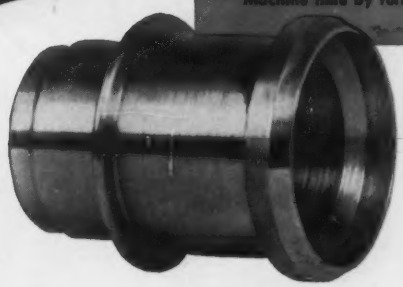
Printed in U. S. A.

JONES

JOB FACTS:
Parts . . . . . Pilot Stud—1⅝ x 6" long
Material: . . . . . A-4615 CR Steel
Machine time on Model M: . . . . . 7½ minutes
Machine time by former method: . . . 17 minutes



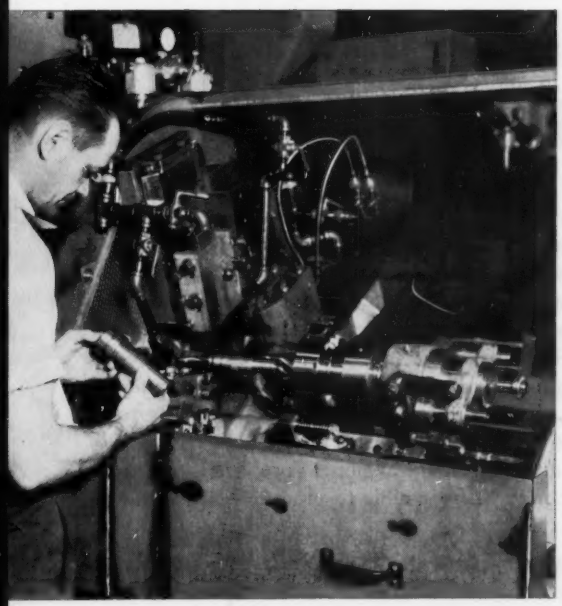
JOB FACTS:
Part: . . . . . Whirl—3½ x 4⅝" long
Material: . . . . . Leaded Open Hearth Steel
Machine time on Model M: . . . . . 3¾ minutes
Machine time by former method: . . 21 minutes



here's why it takes

more than just speed

to keep production on schedule

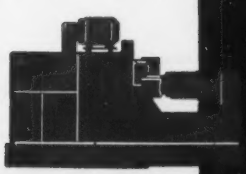


It's one thing to be able to machine a steel part at the fastest practical speeds and feeds. But speed without dependable control is wasted. You get both speed and control with MODEL M SINGLE SPINDLE AUTOMATICS.

Take the parts shown. In both cases, the completed pieces are machined automatically at their same predetermined rate every time, without interruption. In the long stud there are 11 operations including threading—the piece is completed on the Model M in less than half the time of the former method. In the other piece (with a large hole partway and a small one the rest of the way) spindle speeds are changed automatically during the cycle to provide the best speeds and feeds for different diameter cuts—and the time for a finished piece is less than ⅓ that of the former method.

Why not get all the facts? Write for Catalog M-50A. Or, better still, ask our engineers to talk with yours about your production jobs—long or short run.

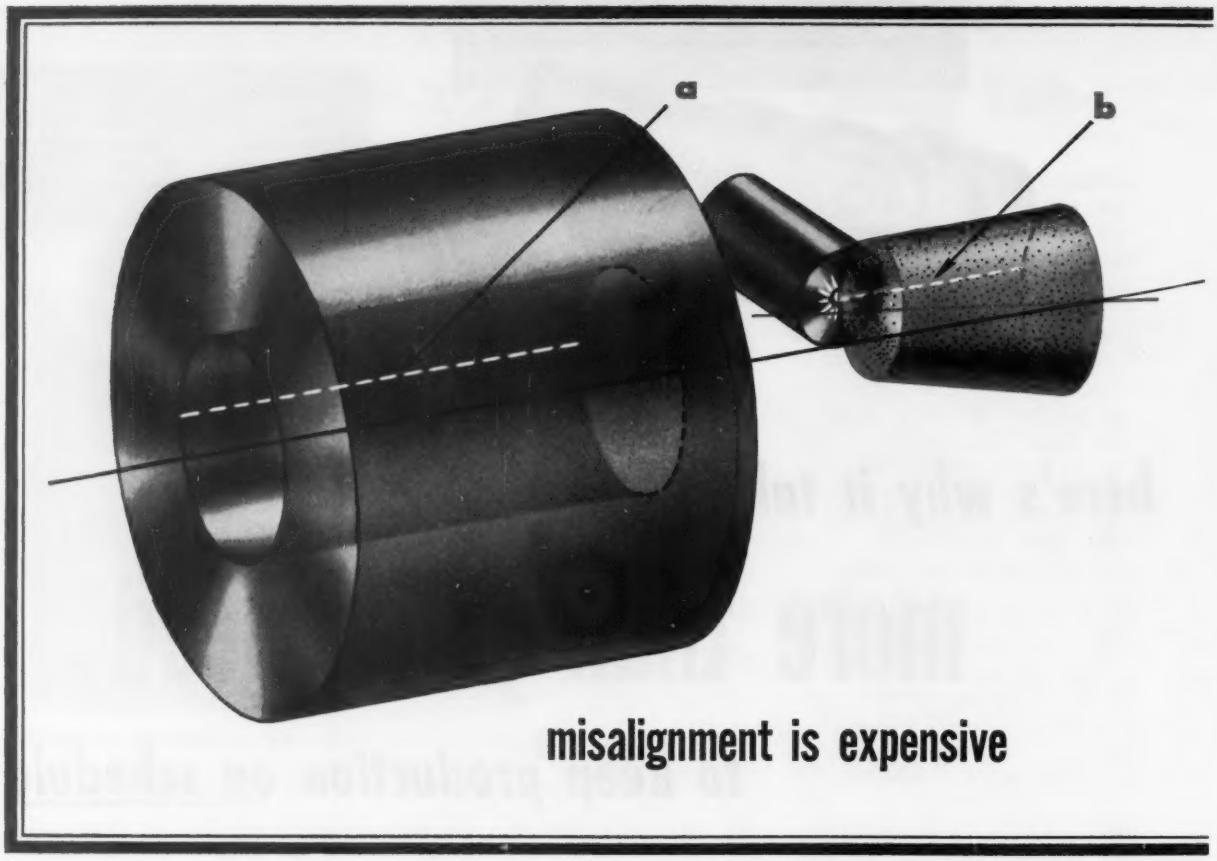
Nothing can so completely destroy profits as the continued use of obsolete equipment.



The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.



misalignment is expensive

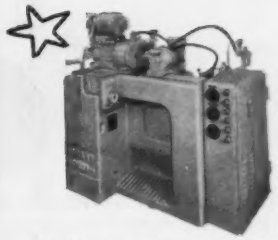
...Bryant controlled alignment

GRINDING a straight hole on an internal grinder is normally done with a straight (cylindrical) wheel. It is sometimes desirable to turn the wheelhead and dress the wheel to a taper in order to use a more rigid projection. However, this setup presents some serious obstacles which cannot be overcome unless they are clearly understood. In order to grind a straight hole the various elements of the machine must be in perfect alignment. The degree of alignment will be determined by the accuracy required on the finished part. A machine may be lined up sufficiently to produce holes within tolerance when grinding with a straight wheel, but if the wheel is turned and dressed to a taper, the alignment problem is magnified to such an extent that it may be impossible to produce holes within the same tolerance.

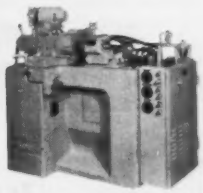
The center lines of the wheel, work and diamond must be in a common plane so that the wheel contacts the work at line "a". If the tapered wheel



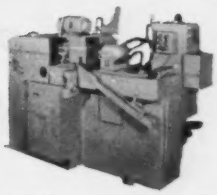
Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie—free showings arranged for engineering groups.



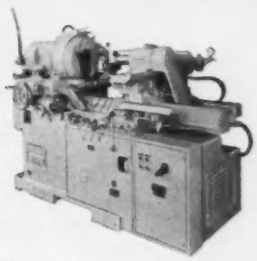
no. 1109 9" swing, semi-automatic



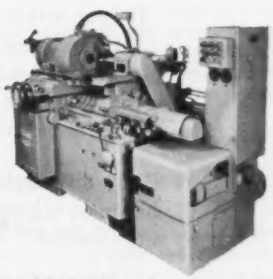
no. 1309-W 9" swing, 2 spindle semi-automatic



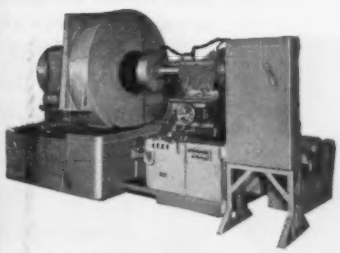
no. 2209 9" swing, automatic



no. 1116 16" swing, semi-automatic



no. 3216 16" swing, automatic



no. 1460 60" swing, semi-automatic

The Bryant 1109 Precision Internal Grinder is a semi-automatic machine, designed especially for grinding small bores. Although intended primarily for bore diameters of less than 1", it has a chuck swing of 9" and a maximum grinding stroke of 3½". By using preloaded ball bearing slide bars for both cross and longitudinal slide movements, sensitivity is obtained without loss of rigidity. These rigid slides transmit the operating load directly to the base of the machine. The Bryant Hi-Frequency Wheelhead, providing speeds up to 100,000 R.P.M., is furnished as standard equipment to assure efficient surface speeds on the wheels necessary for grinding small bores. Write for further information.

gives better internal grinding

contacts the work above or below line "a" the wheel will touch only at its largest diameter and, as the wheel reverses (at the left end of the hole), it will transfer its taper to the work resulting in a tight hole at the back. Turning the workhead or changing the length of traverse cannot overcome this error. Further, because of poor contact, wheel wear will be excessive and finish poor.

If the diamond is set either above or below line "b" (which is a continuation of "a") the wheel will be dressed to a curve (hyperbola) and even if the wheel contacts the work at line "a" it will be only a point contact. Again, the wheel form will be transferred to the work at the point of reversal, wheel wear will be excessive and finish poor. The proper setup calls for the work axis, wheel axis and diamond to be in a plane parallel to the longitudinal and cross motion of the machine.

see our catalog in MACHINE TOOL CATALOGS or write for copy

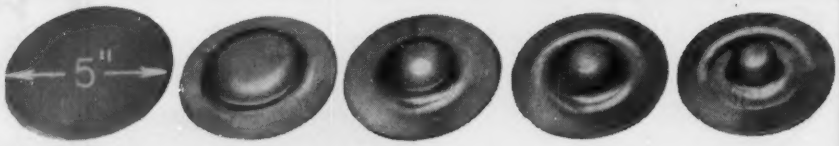
Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Offices: Indianapolis · Cleveland · Chicago · Detroit · Mt. Vernon, N.Y. · Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

For more information on products advertised, use Inquiry Card, page 243



BLISS' 1000th Transfer Feed Press

***It feeds itself \ checks and corrects errors ***

***performs 11 separate press operations ***

***and delivers 28 completed parts per minute ***

all automatically

At Ford Motor Company's Ypsilanti plant, the Bliss 13-station transfer feed press turns out starter brush end plates—a part which was formerly die cast.

The press takes the 0.090-inch blank, puts it through six successive draws, flanges it, irons the cup within a tolerance of ±0.0005″ on the I.D., restrikes the flange, pierces ten tiny holes, lances four locating tabs, and then trims the part to final diameter. Tolerance range throughout: from ±0.0005″ to ±0.005″.

And while all this is going on all the attendant has to do is keep the turret mechanism loaded with blanks!

However, the truly unusual feature of the press is this: practically everything that can go wrong has been anticipated and guarded against by electrical control circuits. Tiny switches police trouble areas and take corrective measures when needed.

In short, the press thinks as it works—*that's* automation. An up-to-the-moment example of Bliss press engineering, this transfer feed press is the thousandth such press produced by Bliss since it pioneered the transfer feed principle back in the 90's. Today Bliss transfer feed presses are a by-word in arsenals, can-making and metalworking plants—wherever speed and accuracy are musts.

If you have a pressroom problem—large or small—a Bliss field engineer will be glad to help you in whatever way he can. And behind him stands the resources of the entire Bliss organization—the world's largest press builder.

E. W. BLISS Company
Canton, Ohio
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

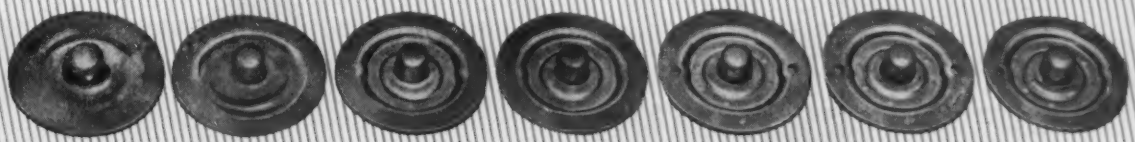
BLISS
SINCE 1857

Remember: BLISS is more than a name . . . it's a guarantee

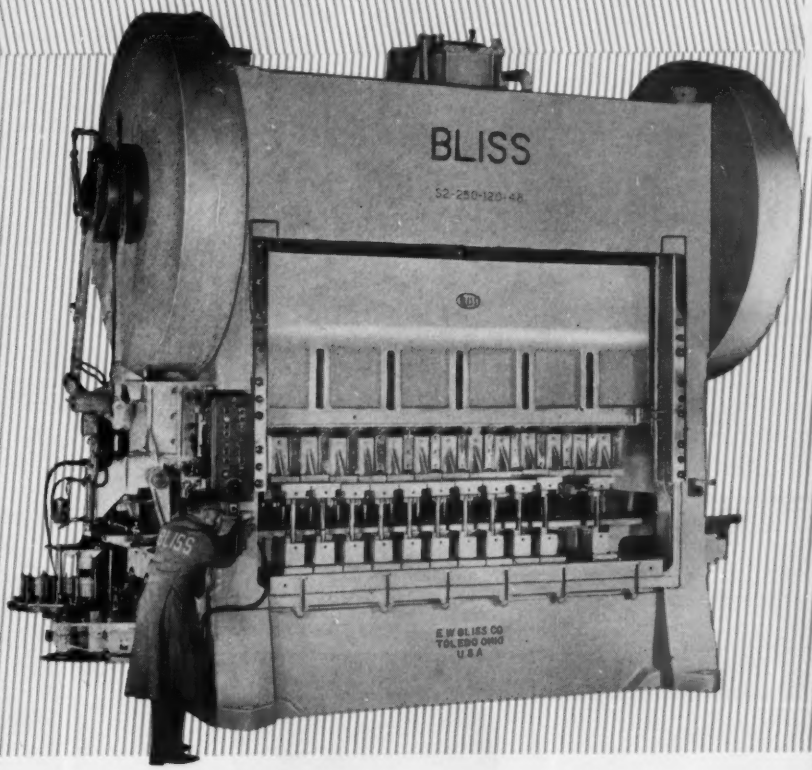
Subsidiary: The Die Supply Co., Cleveland, O. • E. W. Bliss (England) Ltd., Derby • E. W. Bliss Co. (Paris) France

U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada.

Other representatives throughout the world.



STAMPING SEQUENCE... The first six, from left to right, are successive draws. Step seven forms the flange. Eight irons the cup to size (tolerance here: 0.0005″ on the I.D.) and restrikes the flange. Step nine: ten holes are precisely pierced. Next, the four locating tabs on the flange are lanced. The final operation trims the diameter all around. Blank size: 5″ diameter by 0.090″ thick. Tolerance range: from ±0.0005″ to ±0.005″. Production rate: up to 28 per minute.



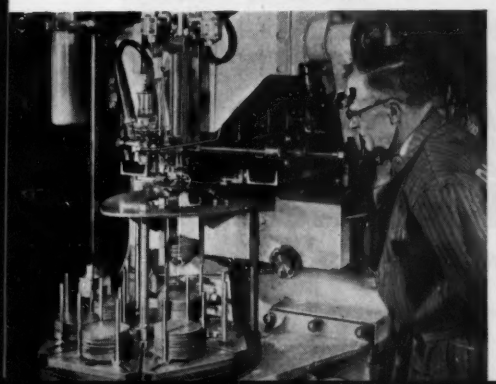
VITAL STATISTICS... Straight side double crank design; 120″ between uprights; 48″ front to back; single geared with twin drive; gears totally enclosed and immersed in oil bath; speed adjustment—14 to 28 spm; stroke of slide 8″—motorized slide adjustment range 10″; cam-actuated knockouts in individual slides accommodate various shell heights; high-speed single disc air clutch. Press and die design has purposely been kept flexible so that it can be readily adapted for a variety of jobs.



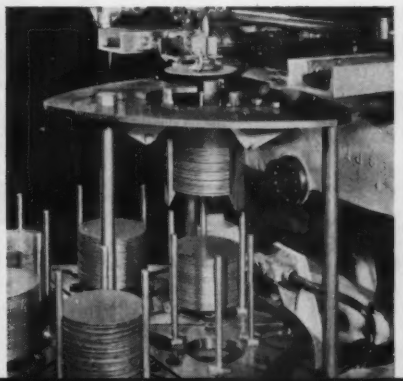
DOUBLE TROUBLE... When two blanks stick together and feed into the press, they lift this feeler, close the micro-switch and actuate a solenoid which opens a trap door in the press bed. The blanks fall through the trap door; the press goes on uninterrupted. That's typical of the many automatic safeguards incorporated into the press.

Automatic feed system: all it requires is loading

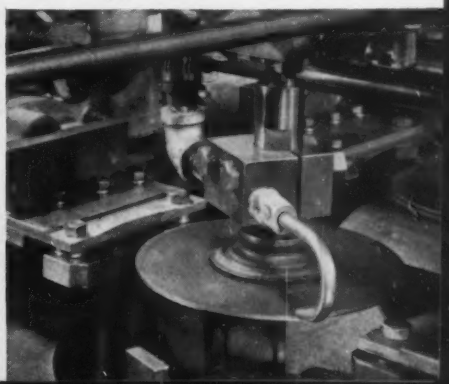
OVERALL VIEW shows the position of the automatic feed mechanism at the entry end of the press. Note that one load of blanks has been picked up from the six-station turret located below. Turret now moves next load of blanks into the ready position.



CLOSER VIEW shows vacuum cup holding a single blank between the slide bars. Close examination reveals the gripping fingers which will close in on the blank, grip it and then move it into the press, release it and return to their original position.



STILL CLOSER VIEW clearly shows gripping fingers in ready position as blank is held by vacuum cup. Curved tube in foreground shoots a blast of compressed air at side of blank to force off extra blanks that may be stuck to top one.



PUT "LIGHT-BAND" ACCURACY IN YOUR TOOLROOM

...with a 24" Taft-Peirce Precision Lapping Machine — Only $1,075



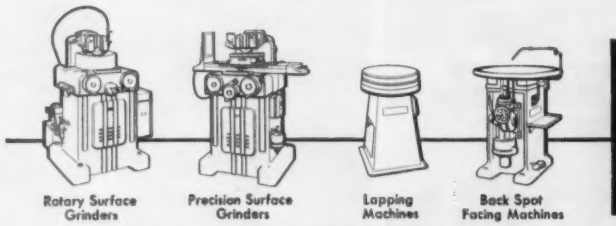


Low in cost, economical to operate and maintain, this 24" lapping machine is ideal for high precision work both in the toolroom and in small lot manufacturing departments. Accurate, dependable, convenient, it's capable of producing surfaces flat within 2 to 3 light bands.

The lapping area is a full 24" in diameter. Plates are of close grained cast iron, heat treated and precision ground to ensure permanent flatness. The spindle is roller bearing mounted, and the base construction is of extreme rigidity.

The plates (grooved for flat or plain for cylindrical pieces) are interchangeable in only a few minutes' time. Plain plate is standard . . . machine furnished with grooved plate is $1100.

For more information on this and many other Taft-Peirce toolroom items, send for your copy of the Taft-Peirce Handbook.



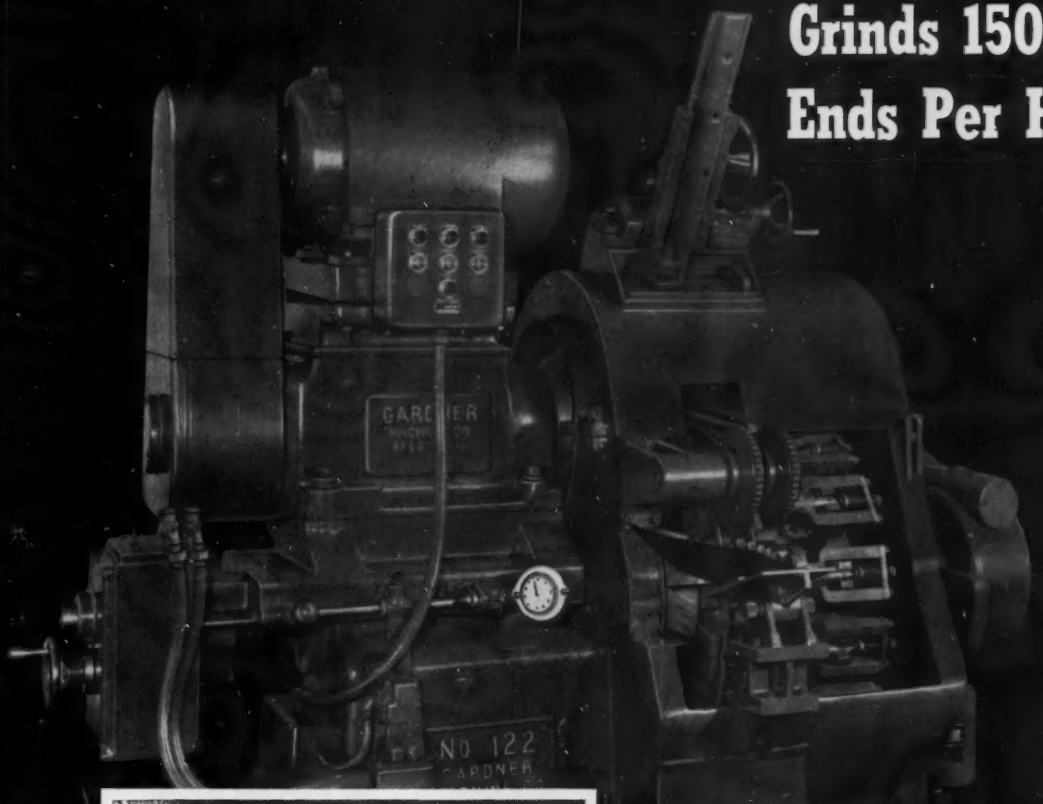
T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

For more information on products advertised, use Inquiry Card, page 243

Semi-Automatic Gardner Disc Grinder

Grinds 1500 Spindle Ends Per Hour



automatic unloading



automatic loading



work data

MACHINE	Gardner No. 122-23" Single Spindle Grinder.
PART	Cotton picker spindle.
PRODUCTION	1500 per hour.
STOCK REMOVAL	5/16" maximum.
TOLERANCE	.004" for uniformity.
TOOLING	Vee-notched rotary work carrier with gravity-type magazine feed and double chain hold-down.
ABRASIVE	Gardner Yellow Rim Wire-Lokt Disc.

GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U. S. A.

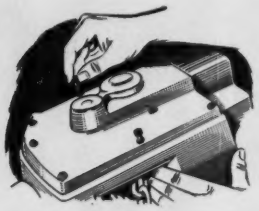
GARDNER

precision disc grinders

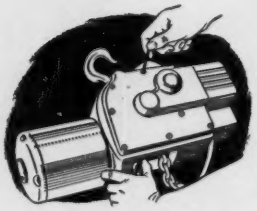
134M



23 UNBRAKO Socket Head Cap Screws are used to assemble this lightweight, high efficiency electric hoist. They were selected for their uniform accuracy and high tensile strength.



The knurling on the head of UNBRAKO Socket Head Cap Screws permits faster assembly, because of the positive slip-proof grip.



The uniform depth and size of the hex socket assure strength and maximum torque in wrenching—extremely important in the cap screws used to fasten assemblies like this.



UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. In standard sizes from #4 to 1".

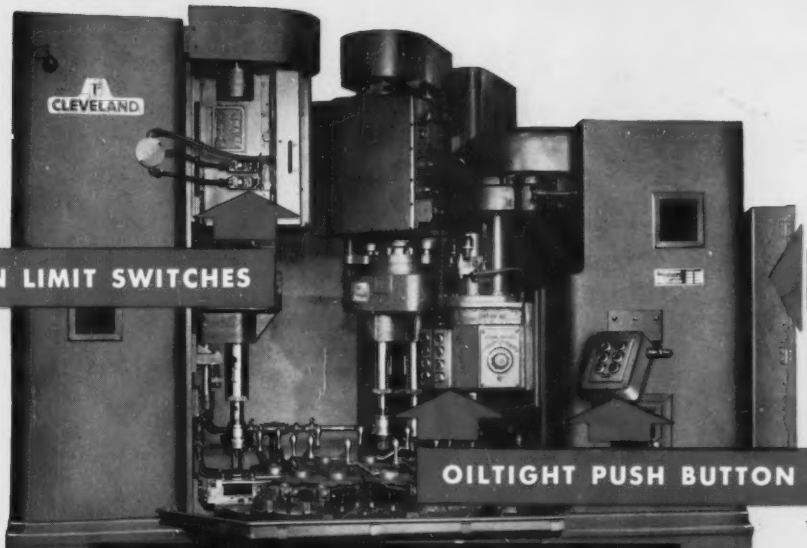
Save time and money by using UNBRAKO Standards...stocked by your distributor

You'll have less money tied up in inventory, you'll need less space for storage, you'll get personalized service and faster deliveries. And you'll be buying the finest socket screw products that modern machines, complete facilities and quality control can produce. Write for UNBRAKO Standards, a complete listing of socket screw products made by the world's largest producer. STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA



For more information on products advertised, use Inquiry Card, page 243



PRECISION LIMIT SWITCHES

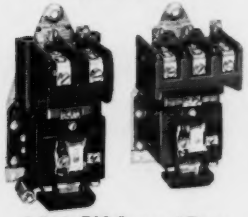
SPECIAL CONTROL PANEL

OILTIGHT PUSH BUTTON STATIONS

Quality A-B MOTOR CONTROLS for Automatic Machines



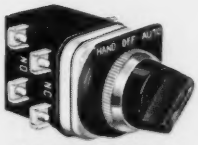
Bulletin 709
Solenoid Size 3 Starter



Bulletin 702 Two and Three
Pole Size 1 Contactors



Bulletin 350 Drum Switch
for Flush Mounting



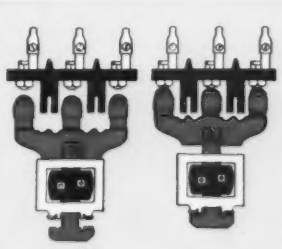
Bulletin 800T Oiltight
Selector Switch

When you sell your machines fully equipped with automatic motor controls, make these controls a featured sales asset. Standardize on a line . . . like ALLEN-BRADLEY . . . having a world-wide reputation for QUALITY . . . and you can guarantee "complete" customer satisfaction.

Independent industry-wide surveys list ALLEN-BRADLEY controls at TOP preference among machinery users. In test after test ALLEN-BRADLEY motor controls are the first choice of designers, shopmen, and electricians. They like the simple A-B design and trouble free operation. They like the fine A-B appearance. They like the big line of A-B accessory controls that solve so many control problems so easily. They like the all around A-B "Quality."

We shall be glad to send you the Allen-Bradley Handy Catalog. Please write for your copy, today.

The reason for the trouble free performance of Allen-Bradley solenoid starters is the simplicity of design. There is but ONE MOVING PART . . . the ONE PIECE solenoid plunger which carries the double break moving contacts (shown in red).

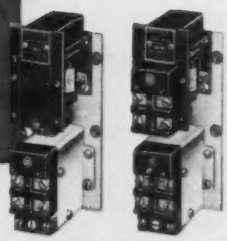


SIMPLE—
Only One Moving Part

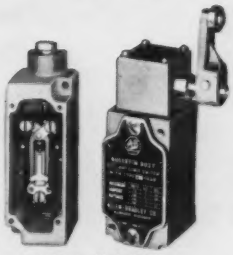
The double break fixed contacts are mounted in the molded contact block (shown in black).

The cadmium silver moving and stationary contacts need no filing, cleaning, or dressing. They are good for millions of switching operations.

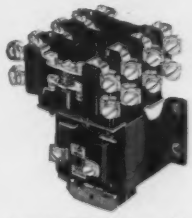
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited—Galt, Ont.



Bulletin 849 Pneumatic Timer
Adjustable—1/6 to
180 Seconds



Bulletin 801-802T
Limit Switches



Bulletin 700 Universal A-C
4-Pole Relay



Bulletin 892 Terminal Blocks
for Special Control Wiring

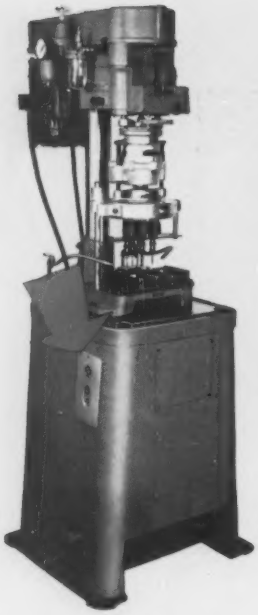
ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

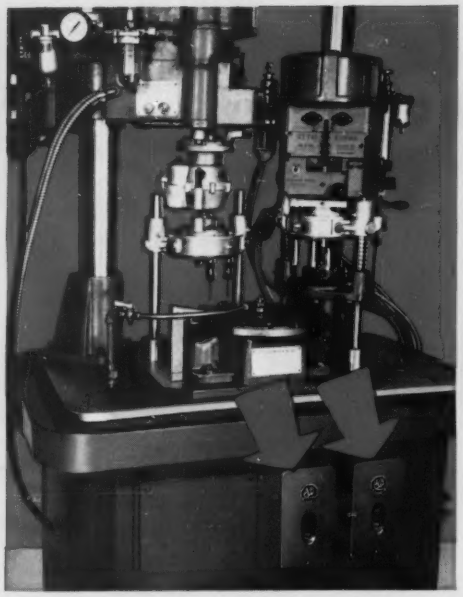
QUALITY

A-B Quality

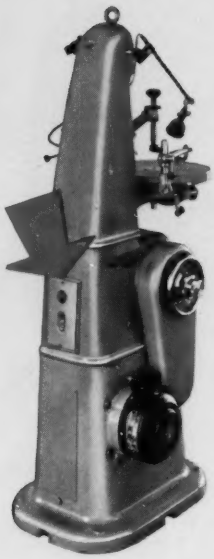
9-54-R



Ettco single spindle tapping machine with manual flush starter.



Ettco multiple spindle drilling and tapping machine with two Allen-Bradley Bulletin 609 manual flush type motor starters.

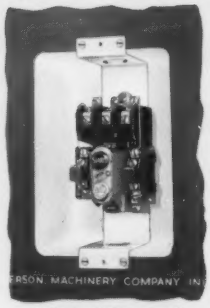


Williams punch and die making machine with A-B flush type starter.

Improve the appearance of your machines with A-B flush type motor starters

When contemplating the design of a new machine, take advantage of the opportunity to "streamline" your design by recessing into the base of the machine at least the starter—and perhaps this can also be done with the motor.

Look at the trim appearance of the three motorized machines shown above. Note how the designers have provided recessed cavities for flush type Allen-Bradley Bulletin 609 manual motor starters.



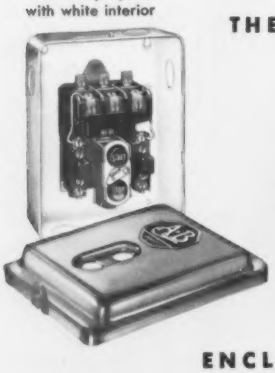
Bulletin 609 manual starter in machine base

These flush type motor starters give a smooth, modern appearance to the machines and, therefore, provide a "sales value" that can be used to advantage.

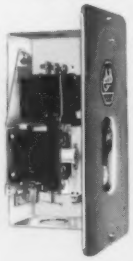
Allen-Bradley Bulletin 609 manual starters, Bulletin 709 automatic starters, and Bulletin 712-713 combination starters can be furnished in several types of flush mountings. They are fully described in the Allen-Bradley Handy Catalog. Send for a copy, today.

THE LINE OF BULLETIN 609 MANUAL STARTERS

General purpose with white interior



Flush type



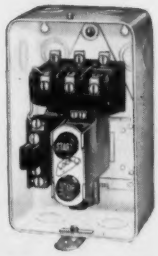
Weatherproof & waterproof



Explosion proof



Single phase



ENCLOSURES FOR EVERY OPERATING CONDITION

9-54-R

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Limited—Galt, Ont.

A-B Quality

ALLEN-BRADLEY

BULLETIN 609 QUALITY MANUAL STARTERS

Threading that's tough...or



Threading that's fussy...



it's just another job for



Here's why so many shops standardize on the Namco VERS-O-TOOL system

- One set of ground thread chasers produces more threads than 10 sets of radial hobbed and lapped chasers.
- The Namco Vers-o-tool System (with its patented Micrometer Grinding and Checking Gauge) takes the guesswork out of chaser grinding, for chasers are ground on their holding blocks so that when replaced in the head they will cut identical threads—without making trial cuts—without adjustments—without time or scrap loss.
- **Standard stockable NC and NF Chasers, also National Taper Pipe and Dry Seal carried in stock.**

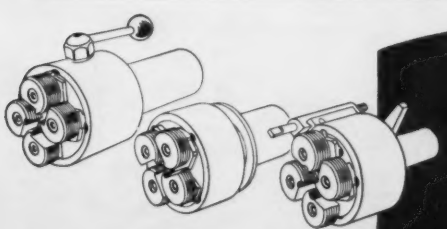
VERS-O-TOOL

These are all Class 3 threaded parts from 347 stainless steel—special threads having rounded tops and bottoms and with 32 micro finish specified.

No every day jobs to handle, these pieces, because the work-hardening tendencies of the material under cutting pressures call for the right tools and special caution to maintain the class and finish demanded.

Plenty of shops experimented with various methods of thread chasing and grinding but it remained for Screw Products Company in Cleveland to lick the job. They are using standard Vers-o-tools for diameters to 1" with standard ground thread circular chasers and are "having no trouble at all".

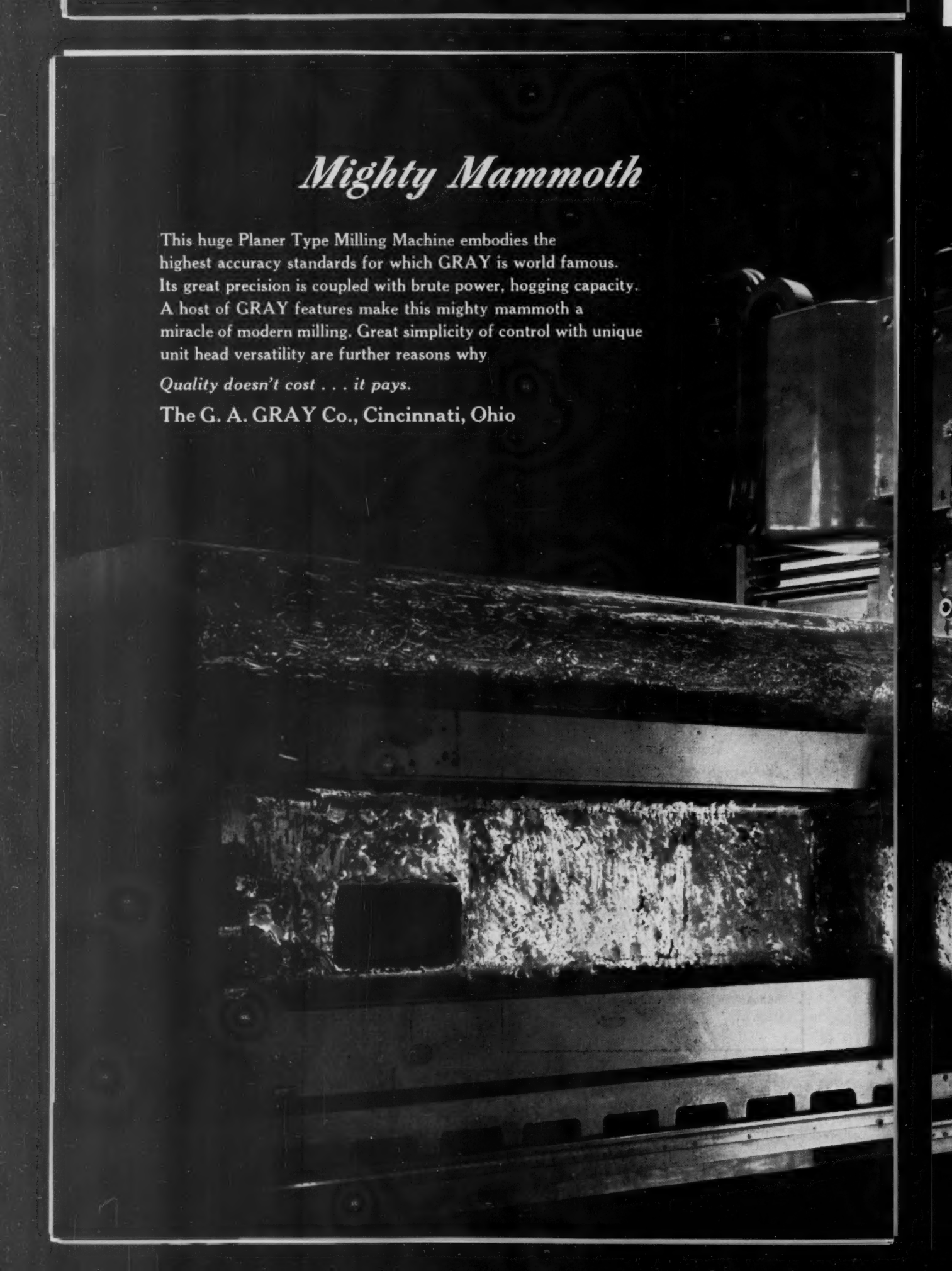
Doesn't this suggest your inquiry on threading work, either tough and fussy jobs or run of mine? Catalog DT-52 will help.



The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

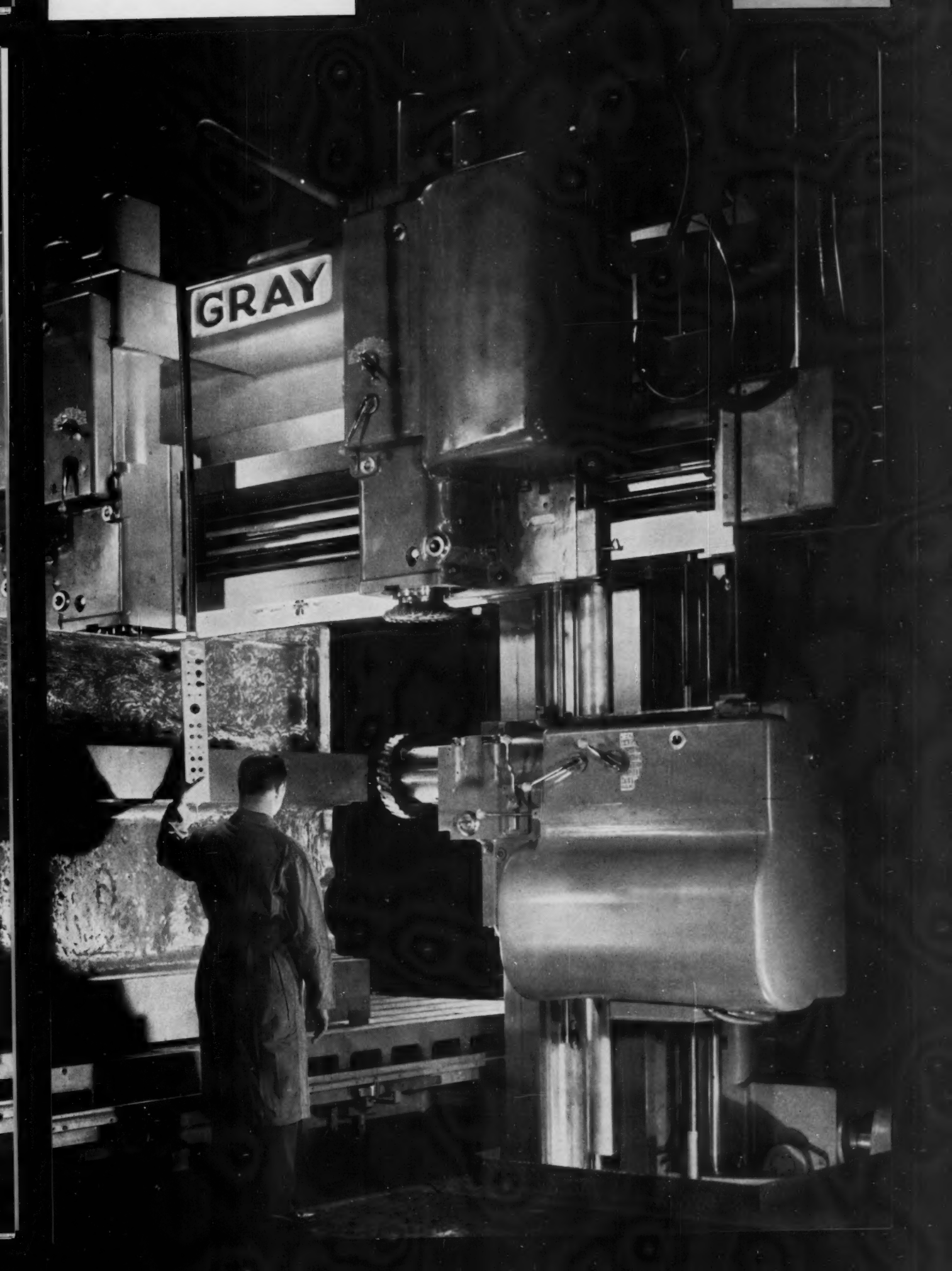


Mighty Mammoth

This huge Planer Type Milling Machine embodies the highest accuracy standards for which GRAY is world famous. Its great precision is coupled with brute power, hogging capacity. A host of GRAY features make this mighty mammoth a miracle of modern milling. Great simplicity of control with unique unit head versatility are further reasons why

Quality doesn't cost . . . it pays.

The G. A. GRAY Co., Cincinnati, Ohio

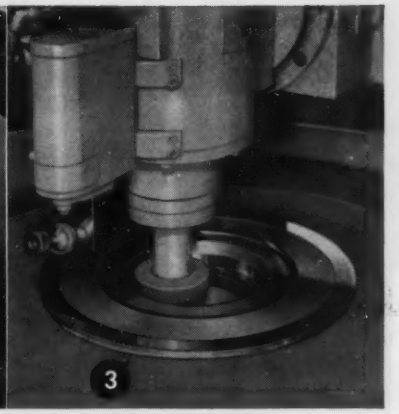

GRAY

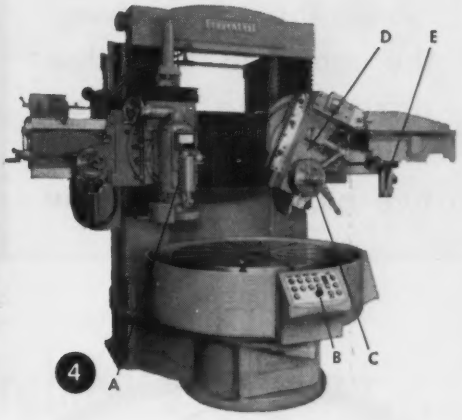

One set-up...

...and you can turn, bore and finish grind a single workpiece to close tolerances on the NEW FRAUENTHAL SERIES 3100 TURNING AND GRINDING MACHINE.

With it, you obtain unusual machining accuracies that assure concentricity of related surfaces.







WITH the new Frauenthal Series 3100 precision turning and grinding machine you get accuracies previously considered impractical.

Designed to meet the most exacting requirements of jet engine manufacture as well as other precision applications, the Series 3100 machine is new from the ground up. Its unique design presents a host of opportunities to put large and extremely close-tolerance jobs on a mass production basis. And the 3100 offers exceptional capacity for precision turning and precision grinding.

Check these salient features

- Ultra-precision work table bearings
- Hydraulically actuated turning slide
- Hydraulically actuated grinding slide
- Super precision grinding spindle
- Conveniently located controls and safety switches

. . . and this optional equipment

- Hydraulic tracer control
- Electronic table surface speed control
- Hydraulic wheel dressers for varied applications

Frauenthal Division

THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN

...about the pictures

PHOTO 1 shows how the operator uses a Series 3100 machine to finish bore the inside diameters preparatory to grinding operations.

PHOTO 2 shows the machine's contouring attachments being used to face the top surfaces of a workpiece.

PHOTO 3 shows how the machine performs close-tolerance finish grinding of the workpiece's top surfaces and inside diameter, to assure concentricity and squareness of related surfaces.

PHOTO 4 illustrates (a) grinding spindle with graduate swivel mounting, (b) push-button control panel, (c) five-station tool turret, (d) hydraulic actuated turning slide, (e) hydraulic tracer control (optional).

May we help you?

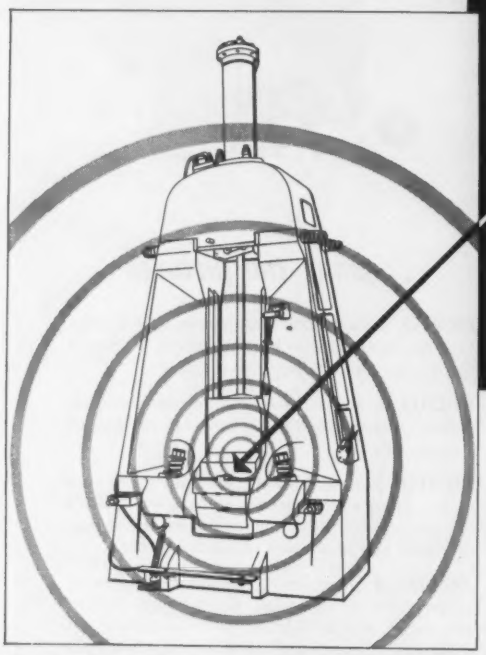
If you'd like further information on how the Series 3100 precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.



CECO-DROP'S LOW CENTER OF GRAVITY ASSURES AGAINST MIS-MATCHED FORGINGS

The center of gravity of the CECO-DROP approximates the center of gravity of the ram at the point of impact, minimizing the fight between the ram and the other parts of the hammer. This gives a more effective blow, preserves die alignment, which assures fewer rejects, and results in higher production in comparison with other types of hammers.





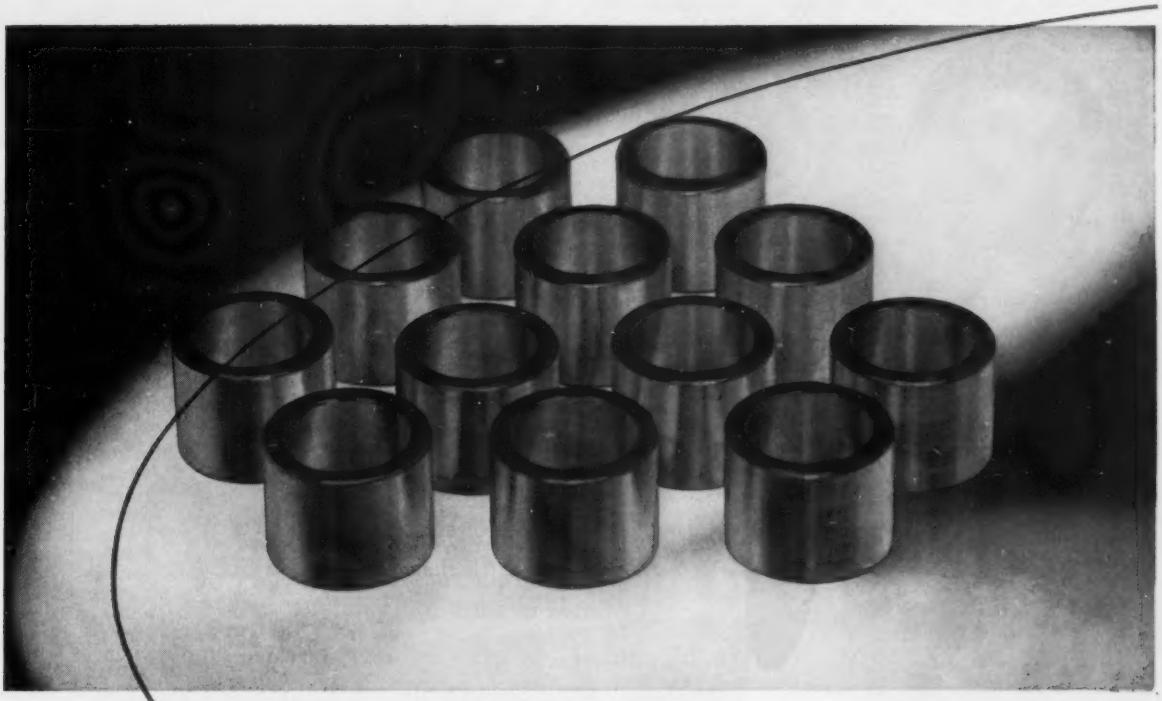
Write for a copy of Bulletin 57-L-4

CECO-DROP

Made by the BUILDERS of THE IMPACTER

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

For more information on products advertised, use Inquiry Card, page 243



these requirements in mind...

So varied are the demands on multiple spindle automatics it is impossible to design into one model — or a number of models — all the facilities that will satisfy every requirement. To excel in any range of work the design of a machine of this type must be directed toward that work.

Cone's new General Datalog lists over forty CONOMATIC models that are designed with these requirements in mind. For any range of work, Conomatics are built to more efficiently serve the latest cutting tool materials.

data for comparison

Part	Bushing
Machine	1⅛" Six Conomatic
Tools	100% Carbide Tipped
Material	Stainless Steel Tubing
Stock Size	1¼" OD; ¾" ID
R. P. M.	Work Spindle — 1033 Opposed Spindle—1048
Time	7 Seconds per Cycle 3.5 Seconds per Piece



Conomatic}

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



we're blushing with pleasure!

One of our customers, who recently called to order his fourth Blanchard Surface Grinder, made us blush with pleasure.

"It's a shame," he said, "that every machine shop owner doesn't know as much about Blanchards as I know.

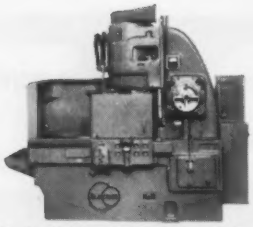
"I use 3 Blanchards almost around the clock in my contract machining business. They make it possible for me to do work much more economically—and in a great deal less time—than my customers can.

"For example, one of my customers had been grinding 1/8" of stock off both sides of 3" x 4" 4140 steel blocks, to a dimension tolerance of ± .0005". The fastest method in his shop involved turning the blocks in a chucking lathe and then grinding them in three operations on his grinder.

"We put the blocks, 17 per load, on a Blanchard and ground them to size . . . *in exactly the same time that my customer needed to turn 5 blocks before grinding.*

"If you could tell every machine shop owner that story, you'd sell more grinders than you could build."

We're following his suggestion!



NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done On The Blanchard", fourth edition, and "Art of Blanchard Surface Grinding"



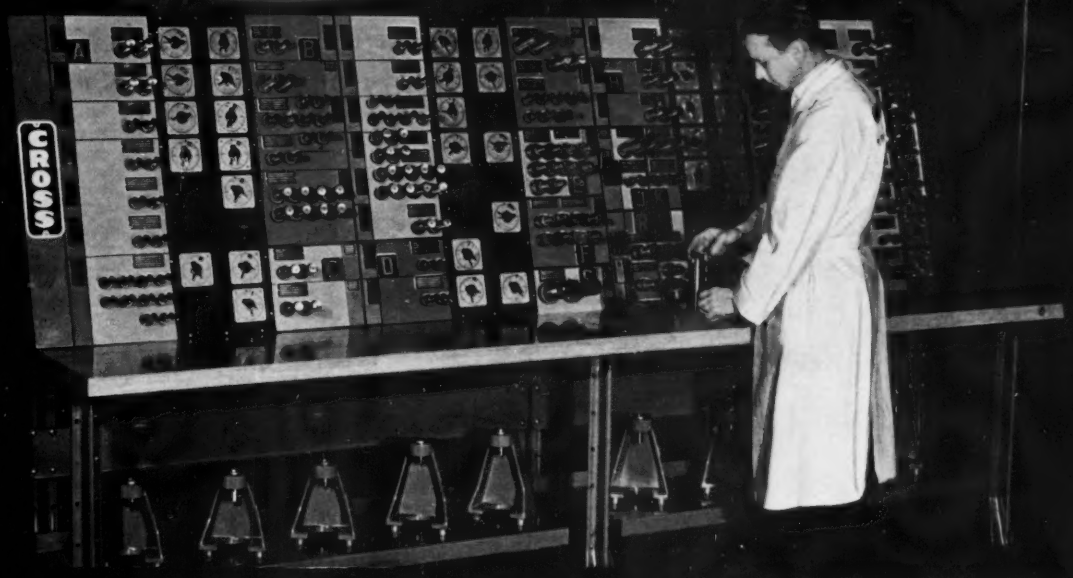
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

For more information on products advertised, use Inquiry Card, page 243

A Mechanical Eye to Watch Your Tools

Cross Machine Control Units Reduce Downtime and Tool Costs



(U.S. Patent Nos. 2679038 and D-163935. Others Pending.)

The Machine Control Unit was originated by Cross to solve tool changing and down-time problems in machines with multiple tooling.

Available for drilling, milling, boring, turning and similar machines, the Control Unit provides many benefits:

- ★ It reduces tool expense by minimizing breakage and grinding.
- ★ It is equipped with Toolometers which automatically stop the machine when tools need changing.
- ★ Other tools indicated by the Toolometers as *almost* used up are replaced at the same time. This grouping of changes drastically reduces downtime.
- ★ Pre-set tools are stored in the Machine Control Unit for instant availability at the machine.
- ★ Standard fixtures and gages are provided for pre-setting the tools to eliminate downtime for machine adjustments and trial cuts.

Over 300 Cross Machine Control Units are now successfully reducing manufacturing costs in plants throughout the country. It will pay you to write, wire or phone for full information *today*.



Master tool setting fixtures and two standard types of gages for pre-setting tools.

Established 1898

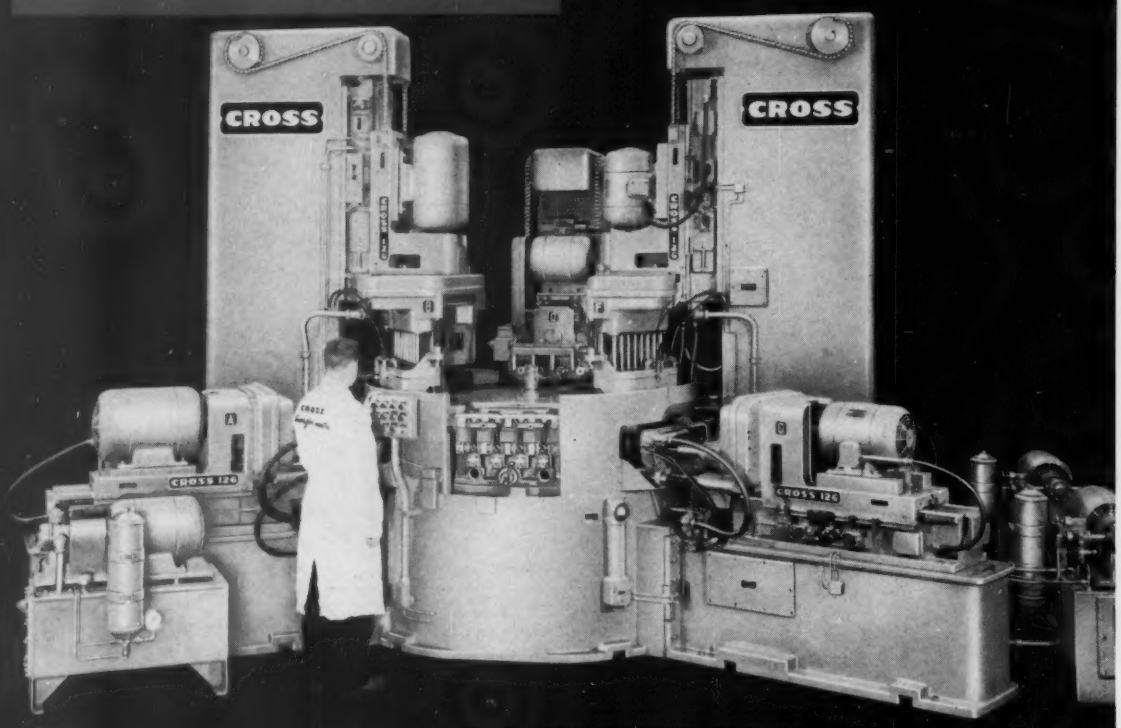
THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Drills, Reams, Chamfers, and Mills Connecting Rods

Another Special by Cross





- ★ 450 pieces per hour at 100% efficiency.
- ★ 6 stations: 1 for loading, 2 for drilling, 1 for chamfering, 1 for milling, and 1 for reaming.
- ★ Drills, reams and chamfers bolt holes; drills, reams and chamfers piston pin hole; and mills lock slot.
- ★ Fluid motor driven index table.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Other features: Hardened and ground ways; coolant system; hydraulic feed and rapid traverse; construction to J.I.C. standards.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS



The new Air Bore Gage brings to small run jobs the basic advantages of the Dimensionair's stable accuracy, precisely calibrated scale, fast set-up, and long range.

THESE ARE NEW



Adjustable AIR BORE GAGES

Get the advantages of extreme accuracy at low cost on smallest production runs

A MAJOR ADVANCEMENT IN AIR GAGING, Federal's Adjustable Air Bore Gages bring the sensitive accuracy and high magnification of the DIMENSIONAIR measuring system to job or to production runs. FOUR GAGES COVER A MEASURING RANGE FROM ½" TO 8". Their light weight makes them very easy to handle. Particularly in the larger sizes and where holes with large diameters are difficult to reach, these light weight gages provide a convenient, non-fatiguing method of checking holes with air.

Since the centralizing contacts are concentric with the axis of the gaging contacts, the gages can be set with gage blocks and measurements transferred to a hole with no significant error. Repetitive accuracy is outstanding. Learn more about this latest development in air gaging. Write

FEDERAL PRODUCTS CORPORATION
4118 Eddy St., Providence 1, Rhode Island

All models of Adjustable Air Bore Gages are regularly furnished with Tungsten carbide gaging contacts. These gages can be used with either the 2500 TO 1 MAGNIFICATION or 5000 TO 1 MAGNIFICATION Dimensionairs, including those now in use throughout industry.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting or Automatically Controlling Dimensions on Machines



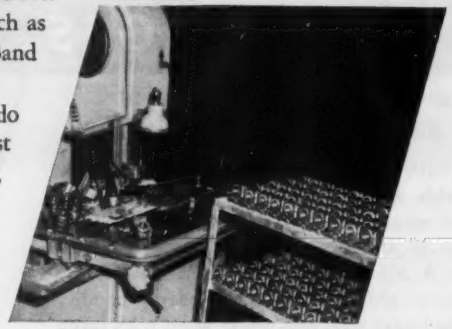
A New Concept For Machining

UNTIL recent years shop men had to use a milling machine to make a slot like that shown above. The old way cost twice as much as the new way with a DoALL Band Machine.

DoALL Band Machines can do many operations at far lower cost than can milling machines, shapers, planers and sometimes even lathes.

The Band Machine removes sections of metal faster than any other machining method. Set-up time is less. Fixtures are simpler. Cutting tool costs are lower.

The Band Machine usually represents from 1/2 to 1/5 the capital investment of other machine tools. It provides true machine tool accuracy and good finishes. New models have variable power feed tables, variable speeds and built-in coolant systems. And, they have the power and rigidity to utilize new DoALL Demon *high speed steel* saw bands. Cutting rates and blade life are phenomenal.



Part to be slotted is placed on simple fixture, automatically fed by power into cutting blade.

All it takes to cut production costs in your shop is to overcome the "conventional" approach. A free demonstration of production band machining at your plant will help you do it. Call your local DoALL Sales-Service Store, or write: *The DoALL Company, Des Plaines, Ill.*



DoALL

Band Machines, Saw Bands, Precision Surface Grinders, Precision Measuring Equipment, Black Granite Surface Plates and a Complete Stock of Cutting Tools at each of 38 DoALL Service-Stores. Call DoALL.

PB-1

NEW WALL CHART FREE: "*How Basic Tools Created Civilization*". Yours on request. No obligation.

For more information on products advertised, use Inquiry Card, page 243

BIG



Spur
Helical
Spur Internal
Helical Internal
Rack
Herringbone
Worm
Non-Metallic
Splines
Coniflex Bevel
Spiral Bevel
Zerol
Hypoid
Intermittent
Sprockets

or SMALL

. . . they're all the same to PHILLIE GEAR®

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.



Industrial Gears & Speed Reducers

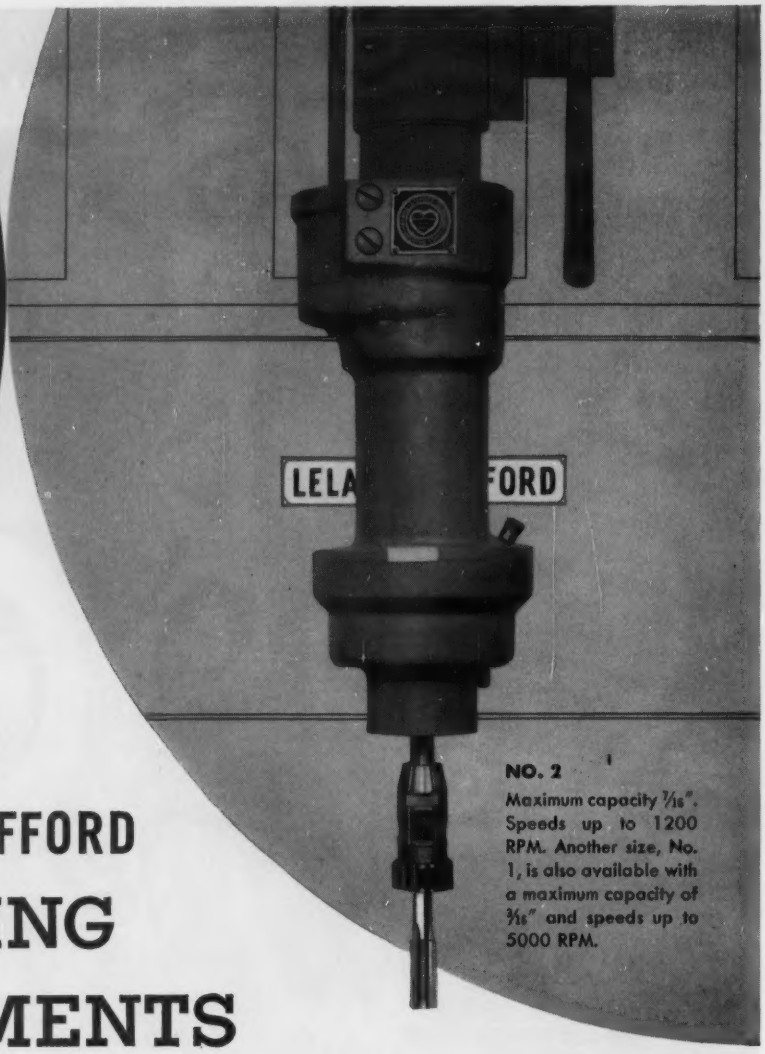
LimiTorque Valve Controls

For more information on products advertised, use Inquiry Card, page 243

turn potential into profit...

with

LELAND-GIFFORD TAPPING ATTACHMENTS



NO. 2
Maximum capacity 7/16". Speeds up to 1200 RPM. Another size, No. 1, is also available with a maximum capacity of 3/8" and speeds up to 5000 RPM.

Use all the speed, precision and efficiency of your Leland-Gifford Drilling Machines in tapping, too — simply by fitting on a Leland-Gifford tapping attachment.

The operator controls the tapping attachment from the feed lever of the machine — exactly as in drilling. He can thus maintain sensitive, fingertip control at all times — greatly increasing production, tapping to depth with great accuracy and practically eliminating the chance of tap breakage.

Leland-Gifford Tapping Attachments will handle class 3 holes with ease. They attach rigidly to the quill and may be instantly stopped or reversed at any time. Full ball bearing assembly assures smooth operation. Reversal is exceptionally smooth due to the friction of steel acting against Textolite*.

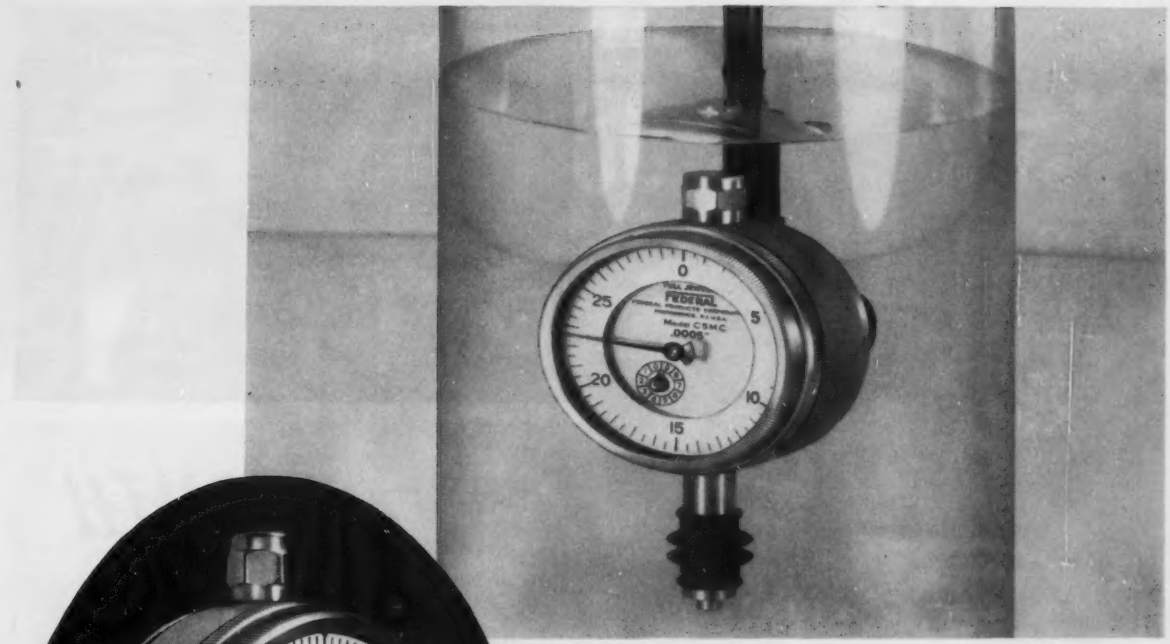
Order one today or write for Bulletin 510-B.

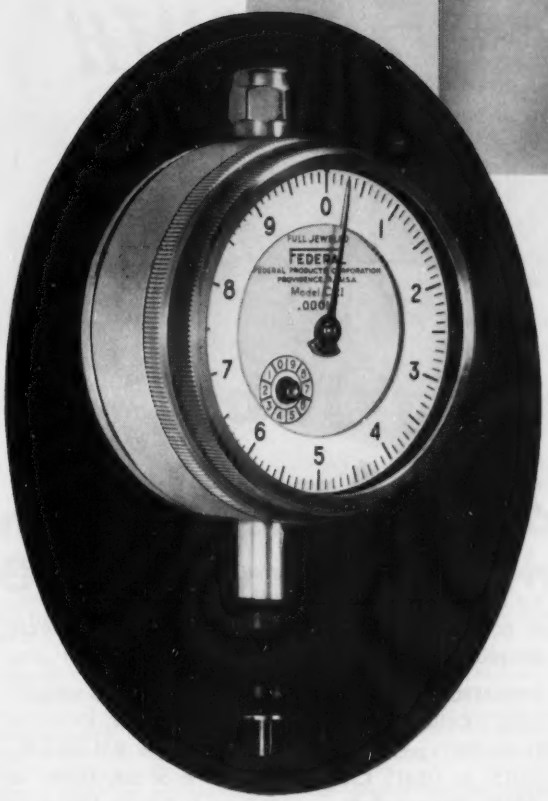
*Plastic impregnated cloth

LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

- **CHICAGO 45**
  2515 West Peterson Ave.
- **DETROIT**
  10429 West McNichols Rd.
- **CLEVELAND 21**
  P. O. Box 217
- **NEW YORK OFFICE**
  75 South Orange Ave.
  South Orange, N. J.
- **LOS ANGELES OFFICE**
  2620 Leonis Blvd., Vernon 58, Cal.
- **INDIANAPOLIS 6**
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Roselawn Station

For more information on products advertised, use Inquiry Card, page 243





You can splash, dunk, or spray this Wetproof Dial Indicator. It will give excellent performance and greatly cut maintenance costs.

AND NOW!

A WETPROOF DIAL INDICATOR

Completely Sealed—Wholly Protected from Coolant, Oil, Oil Fog, and other Liquid Contaminants

IN ANSWER TO REPEATED REQUESTS from Dial Indicator users, Federal now announces this WETPROOF DIAL INDICATOR which eliminates maintenance troubles commonly encountered under adverse operating conditions. "W" Series Dial Indicators are completely wetproofed and built unusually rugged to withstand heavy handling. The internal mechanism is protected by tightly sealed external openings. THE CRYSTAL IS OF GLARE-PROOF GLASS remarkably free of halations. It will not discolor when exposed to oil or staining liquids. A heavy duty case and four oversize back screws make these exceptionally durable Indicators. They are regularly furnished with revolution counter and Cushion Movement. The dial rotates for zero (0) setting. Available in "C" size (2¼" O.D.) and made to AGD specifications (except for minor variations). TRY THIS NEW INDICATOR ON YOUR TOUGHEST JOBS. Write

FEDERAL PRODUCTS CORPORATION
4118 Eddy St., Providence 1, Rhode Island

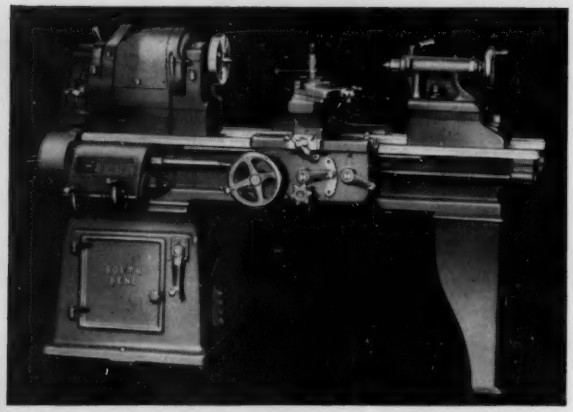
Ask **FEDERAL**

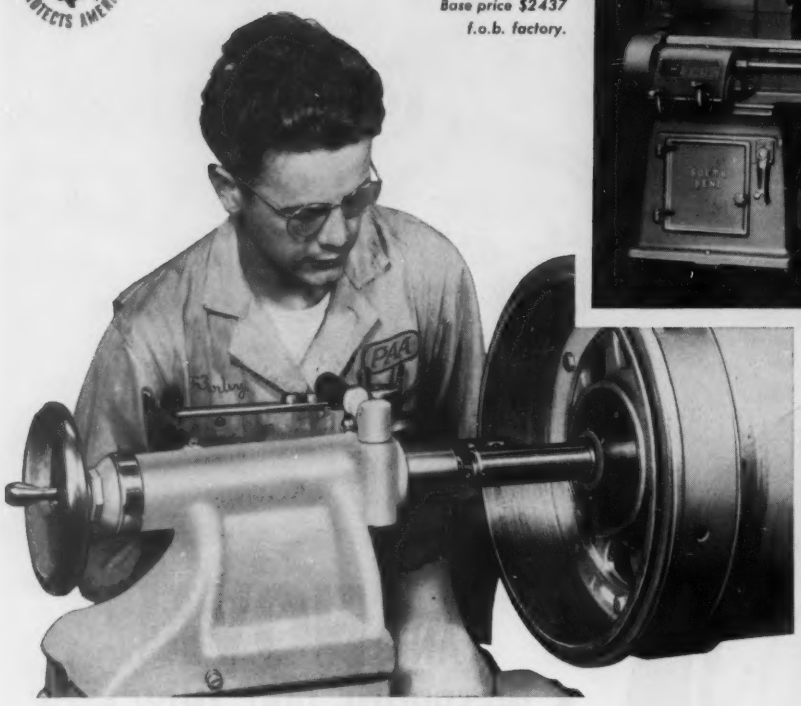
FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting or Automatically Controlling Dimensions on Machines

AIR NATIONAL GUARD · PROTECTS AMERICA ·

16-24" x 6' Quick Change Gear Lathe. Base price $2437 f.o.b. factory.





SOUTH BEND 16-24" LATHE

CAPACITY for Big Jobs! ACCURACY for Any Job!

Here's a lathe with a versatility that makes equipment dollars go further. Its 24" swing provides the capacity for handling a variety of large diameter, medium-weight jobs whose size would otherwise require large, heavy lathes. This extra capacity is achieved without any sacrifice of efficiency in the machining of smaller work.

Having an unusually wide range of spindle speeds, all sizes of work can be machined at effective cutting speeds. The improved South Bend two lever gear box permits instantaneous selection of power feeds for any turning, facing, or thread cutting operation. A complete line of chucks, tools and attachments simplifies tooling the lathe.

SPECIFICATIONS: Swing over bed and saddle wings—24⅜". **Collet Capacity**—1". **Spindle Speeds,** sixteen—11 to 710 r.p.m. **Longitudinal Feeds**—48 R.H. or L.H., .0015" to .0841". **Cross Feeds**—48 in or out, .0006" to .0312". **Thread Cutting**—48 Threads R.H. or L.H., 4 to 224 per inch.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941



Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:



☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES



☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES



☐ TOOL GRINDERS



☐ 7" BENCH SHAPERS

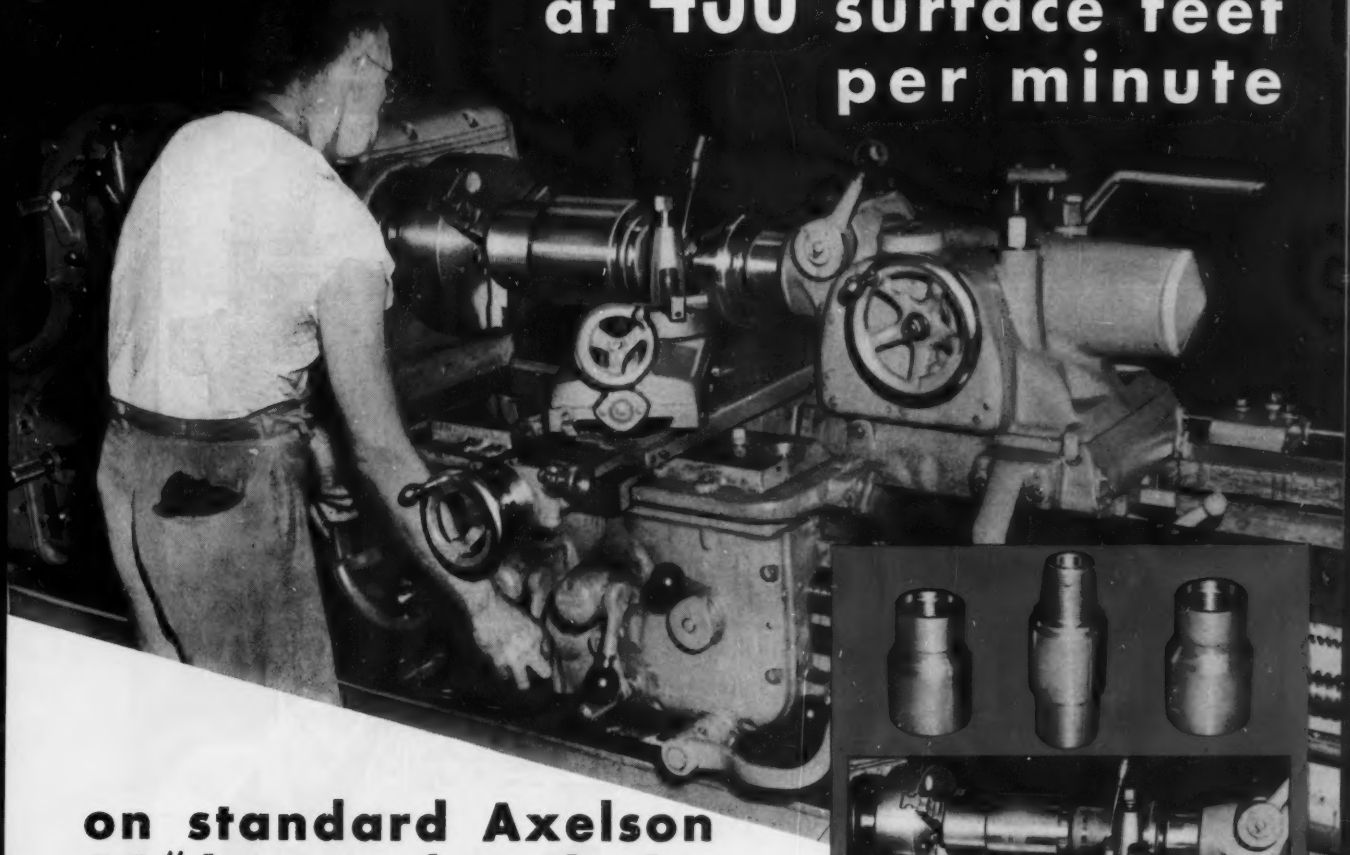
Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

For more information on products advertised, use Inquiry Card, page 243

SAW HARD STEEL TURNED at 450 surface feet per minute



on standard Axelson 20" heavy duty lathe

Heat treated steel forged oil tools that test 38 Rockwell C are precision turned at 450 surface feet per minute on this standard Axelson 20" heavy duty lathe. Both one-quarter inch roughing cuts and fine finishing cuts are made at this speed using Vascaloy E cutting tools and chemical coolant. The cutting tools have chip breakers ground into them and cutting edges are honed to produce better finishes and longer tool life. All turned surfaces including threads are machined to better than 40 micro inch finishes, which eliminates costly grinding operations. Tolerances of — ±.0015" are easily held.

Axelson lathes are precision built and designed to take full advantage of **high speed** cost cutting turning techniques. Standard Axelson 20" lathes now have top spindle speeds of 1288 R.P.M. Spindles are mounted on double front and rear precision timken bearings and are driven through a series of hardened and precision ground alloy steel gears that maintain a smooth flow of power to the cutting tool. Flame hardened and precision ground tool steel carriage ways preserve original accuracy and alignment year after year. These standard Axelson features provide the essential requirements for modern high speed turning. Axelson Engineering will be glad to make suggestions for your work—whatever your problem may be —without obligation.

Call on the Axelson dealer or representative in your locality or write direct to the factory at 6156 S. Boyle Avenue, Los Angeles 58, Calif.

PERFORMANCE DATA

Company	Directo Corp., Houston, Texas.
Part	Drill Collar Sub—"Fluidrill" Part
Machine	Axelson 20" Heavy Duty Lathe
Number of Pieces	10 per Lot
Material	S.A.E. 4340 Heat treated
Hardness	38 Rockwell C
Depth of Cut	¼ Roughing
Greatest Precision	±.0015"
Tool Material	Vascaloy E—with special chip breaker .010" deep, .060" wide, .030" radius, cutting edge honed.
Coolant	Chemical coolant 25-1
Feed	.012" Rough, .008" Finish
Speed	287 RPM—450 S.F.M.
Floor to Floor Time	4½ hours complete
Finish	Better than 40 micro inches
Note	Threads were cut by feeding straight-in at 250 S.F.M.
Product	The Fluidrill is a revolutionary aid that will increase the speed of penetration in rotary oil well drilling of more than 25" by keeping the bit firmly seated on bottom and cutting at all times.



AXELSON MANUFACTURING COMPANY DIVISION

PRESSED STEEL CAR COMPANY, INC.

LOS ANGELES 58, CALIFORNIA

PSC

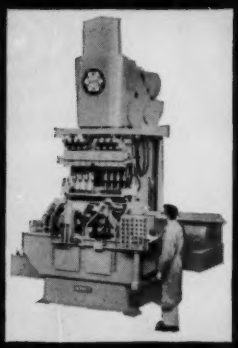
STANDARD PARTS • DAIRY & FARM EQUIPMENT • WASTE CONTAINERS • STAINLESS STEEL COOKWARE • CAR ACCESSORIES • TANKS • AGITATORS • SMOKE STACKS • DUST COLLECTORS COAL & ASH HOPPERS • FITTINGS & ELECTRICAL ACCESSORIES • ORDNANCE MATERIEL • UNISHELTER RELOCATABLE HOMES • EXPORT ONLY LOCOMOTIVES & TRACKWORK CARS (MINE, ORE, CANE, INSPECTION) • UNISTRUT METAL FRAMING • WEED BURNERS • BRICK & TILE MACHINERY • CANE LOADERS

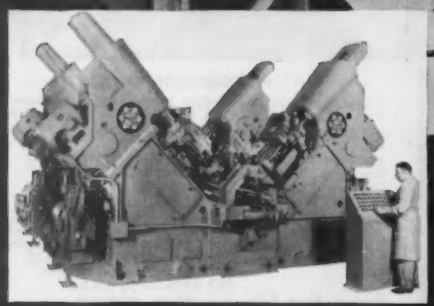
FOR

Production • Accuracy • Economy

V-8 Cylinder Blocks are MICROHONED Automatically on NEW Model 420 Hydrohoners ☆

Specifications of this model are included in our general catalog—obtainable at the offices listed below.





This multiple-spindle, heavy-duty model is designed to fit any type of production line. Examples of its adaptability: above, two four-spindle machines with tip-up fixtures; left, V-type; upper right, eight spindle vertical.

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
2205 Lee Street
Evanston, Illinois

MICROMATIC HONE CORP.
1535 Grande Vista Ave.
Los Angeles 23, Calif.

MICROMATIC HONE LTD.
330 Grand River Avenue
Brantford, Ontario, Can.

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Ave.
Pendleton, Indiana

REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Tidewater Supply Co., Charlotte 4, North Carolina

REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

SUBSIDIARY:

Micro-Precision Inc., 2205 Lee Street, Evanston, Illinois

Hydraulic Controls • Diesel fuel injection equipment

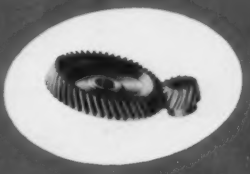
1929 • 1954 — PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC — 25TH YEAR OF DEVELOPMENT

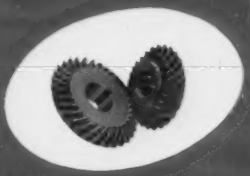
For more information on products advertised, use Inquiry Card, page 243











"The Lowest Bidder

It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all.

When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

John Ruskin

1819-1900

Especially true of Gears

DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA

How complete is "complete"?

Motch & Merryweather builds circular sawing machines which cut off stock up to 43" diameter, ferrous or non-ferrous (titanium to magnesium) –rounds, squares, or structural shapes.

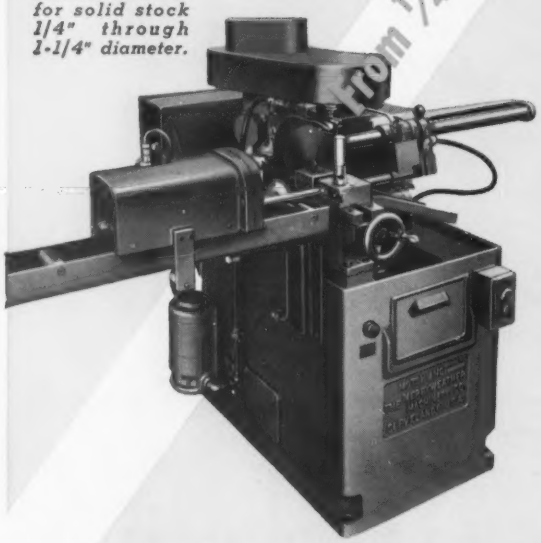


Model No. 5 High Speed Type, for non-ferrous stock through 43" dia.

Fifty Years 1904 • 1954

from 1/4" all the way up through 43" dia.

Model No. 00-A for solid stock 1/4" through 1-1/4" diameter.



Using the Triple-Chip method, Motch & Merryweather circular sawing machines cut off stock faster and more economically than does any other method. We offer you not only a complete line of machines, but complete service after the sale. Only Motch & Merryweather builds all three—the Triple-Chip saw blade, the circular sawing machine which uses it, and automatic blade sharpeners to sharpen and re-sharpen at low cost.

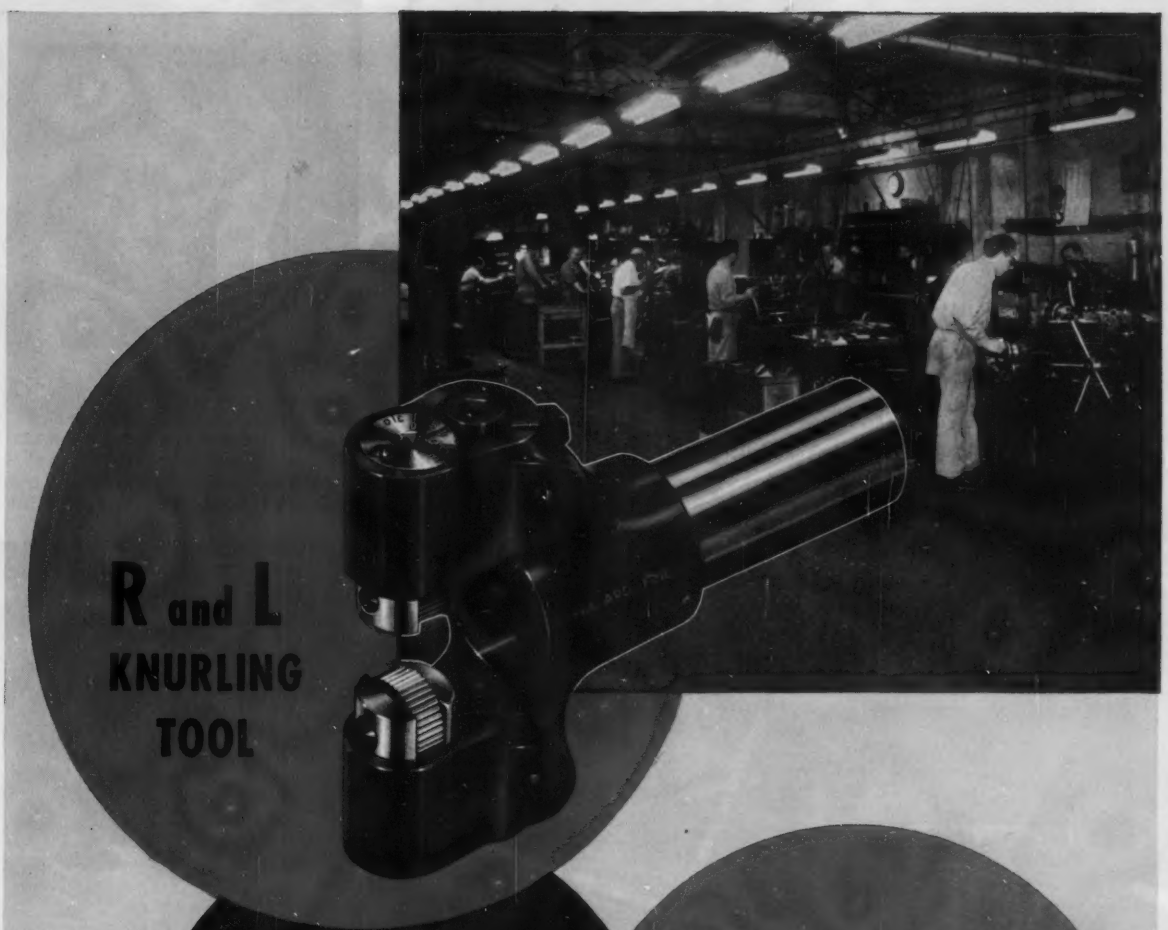
THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

For more information on products advertised, use Inquiry Card, page 243



R and L KNURLING TOOL

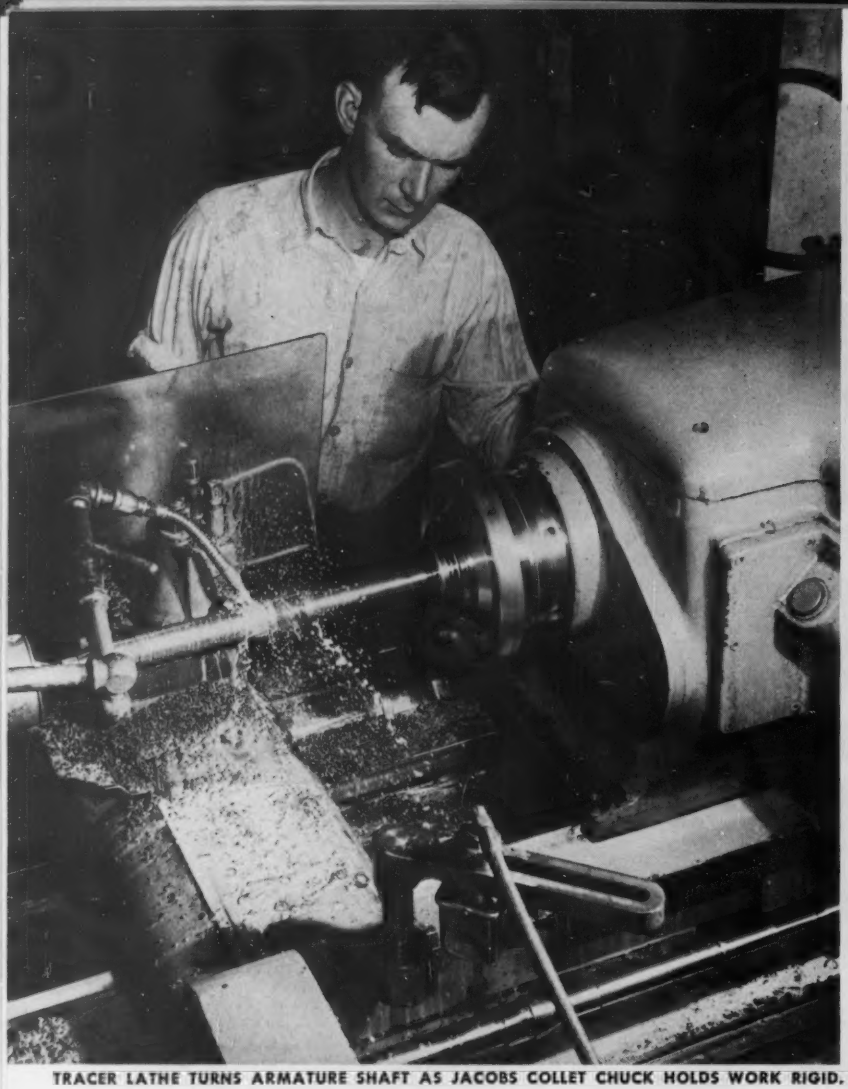
HALF THE WEIGHT . . . TWICE AS EFFICIENT AS OTHER KNURLING TOOLS, ONE HEX WRENCH MAKES ALL ADJUSTMENTS!

The convenient position of the set screw enables you to get to work faster by cutting down your set-up time. The set screw locks the knurl pin securely . . . also allows knurl changing without removing the holder from the turret. The R and L KNURLING TOOL is available in a complete range of sizes. Knurls can be adjusted to any angle, producing either straight or diamond patterned knurling.

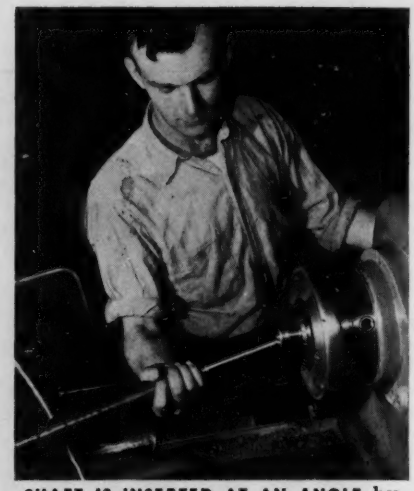
RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL



TRACER LATHE TURNS ARMATURE SHAFT AS JACOBS COLLET CHUCK HOLDS WORK RIGID.



SHAFT IS INSERTED AT AN ANGLE by Walter B. Best, operator. This is allowed by the flexibility of the collet and greatly reduces tailstock resetting adjustment.



COLLET GETS IMPACT TIGHTENING. Handwheel hammer lugs deliver an impact blow on impact sleeve inside handwheel. Force exerted is several times greater than in ordinary hand tightening.

JACOBS SPINDLE NOSE LATHE CHUCK permits use of maximum speeds and feeds on modern tool room lathes. Chucks any bar between 1/16" and 1 3/8". The world's finest collet chuck.

COLLET PERFORMS GRIPPING FEAT

Rubber-Flex Collet jaws close down on work with parallel bearing that defies slippage

International Equipment Company in Brighton, Massachusetts has high praise for a unique collet it uses. The collet daily delivers the tightest, most accurate grip ever devised in lathe collet equipment — 2 to 4 times the gripping power of split steel collets.

This Jacobs Rubber-Flex Collet, the heart of the Jacobs Spindle Nose Lathe Collet Chuck, provides an absolutely parallel grip over the entire bearing surface. Its multiple, long steel jaws are locked together with oil resistant synthetic rubber and offer a length of bearing that is 50–75% greater than can be obtained in split steel collets.

The full 1/8" range of the collet permits chucking bars with variable outside diameters.

"Eleven of these collets have the gripping range of eighty-eight split steel collets," points out Evan Anderson, Assistant Foreman, Maintenance Division.

The collet's radically different construction is considered, by tool engineers, one of the most outstanding developments in modern tool history. Jacobs Spindle Nose Lathe Chucks, known all over the world, are stocked and sold by your Industrial Supply Distributor. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A

JACOBS

IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks
. . . first in service



Harden it for 10¢ with TOCCO*

PROGRESSIVE *Kearney & Trecker Corp.*, Milwaukee, Wisc., reports the following savings by TOCCO hardening the above saddle clamp eccentric of their Milwaukee Milling Machine:

	FORMER METHOD	TOCCO
Heat treating	$ 0.721	$ 0.099
Straightening	0.752	0.000
Cleaning	0.100	0.000
Total Cost	$ 1.573	$ 0.099

Saving . . . $1.47 per piece

In addition to this saving of $1.47 per piece, TOCCO made possible a switch from alloy steel to S.A.E. 1045 steel, saving $0.110 in material cost per piece.

Total saving on each run of 1375 pieces for this one part is $2,172.50.

Kearney & Trecker hardens a total of 140 different parts on one "TOCCO JR." machine. Output of some parts has been increased as much as 500%.

Why not enlist TOCCO's experienced Engineers to help you obtain similar improvements for *your* production?

THE OHIO CRANKSHAFT COMPANY



TOCCO

Mail Coupon Today

NEW **FREE** BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-10, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating"

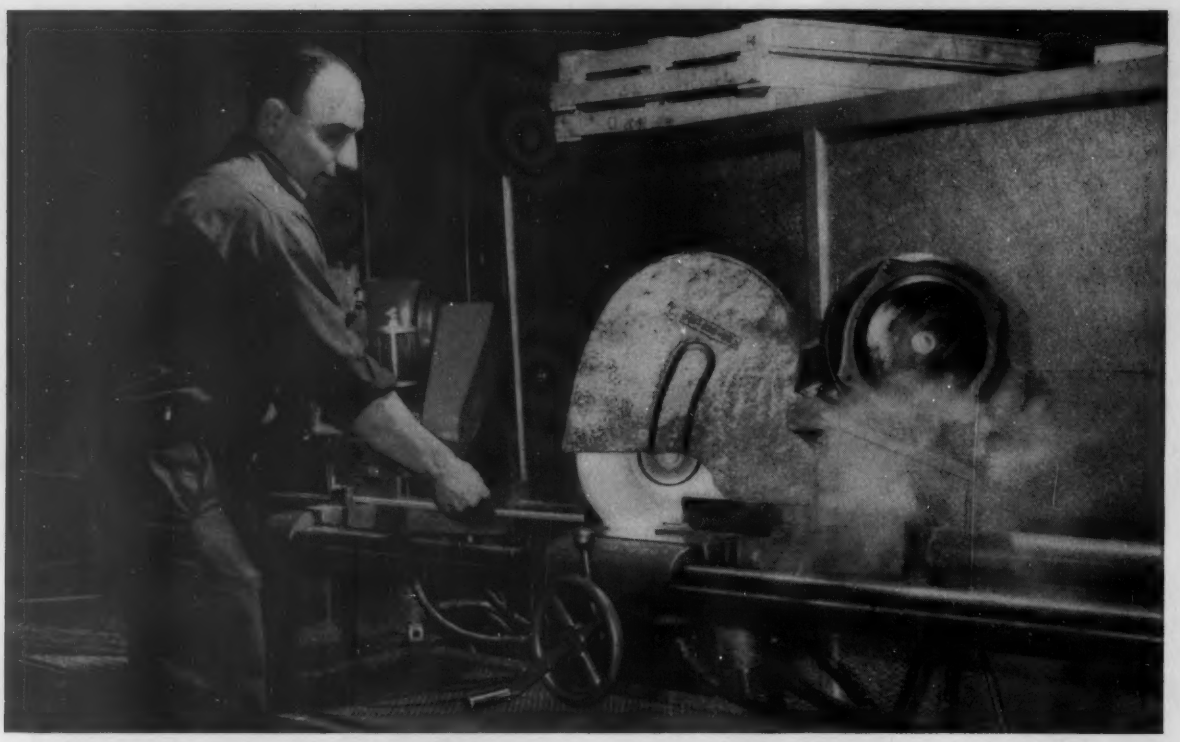
Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____



Aluminum Air Seal Mfg. Co. Reports:

"OUR PROBLEM WITH GRAVITY OILERS WAS SOLVED BY CITIES SERVICE CUTTING OIL!"

When flow of oil from gravity oilers was restricted by gum formation and residue, Aluminum Air Seal Mfg. Co. switched to Cities Service Chillo #22 Cutting Oil. Results: Plenty of oil flow, increased saw life, cleaner finish cuts!

Here's the report as Cities Service received it from D. C. Cover, Plant Supt. of Aluminum Air Seal Mfg. Co.:

"For the past three years we have been using your Chillo #22 with excellent results.

"Prior to that time, we experienced considerable trouble because our gravity oilers were not functioning properly due to residue and gum formation which restricted the flow of cutting oil to the saw. Consequently, this inadequate supply of cutting oil permitted excessive wear which, of course, greatly reduced our saw life.

"At this time, a Cities Service Lubrication Engineer called on us and recommended Chillo #22 as a solution to this problem. Not only was the problem of adequate supply eliminated but we found the oil gave excellent saw life as well as clean finish cuts.

"As you know, we supply aluminum stock to Trim-a-Seal plants throughout the country. *Whenever a new plant is set up we recommend that they use your product for cutting because we know it will do the job.*"

If you'd like to learn more about the oil "we know will do the job," contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



EXAMINING ALUMINUM EXTRUSION, an Aluminum Air Seal employee observes clean cut made with help of Cities Service Chillo #22 Cutting Oil. Firm supplies aluminum stock to 25 Trim-a-Seal plants throughout country.

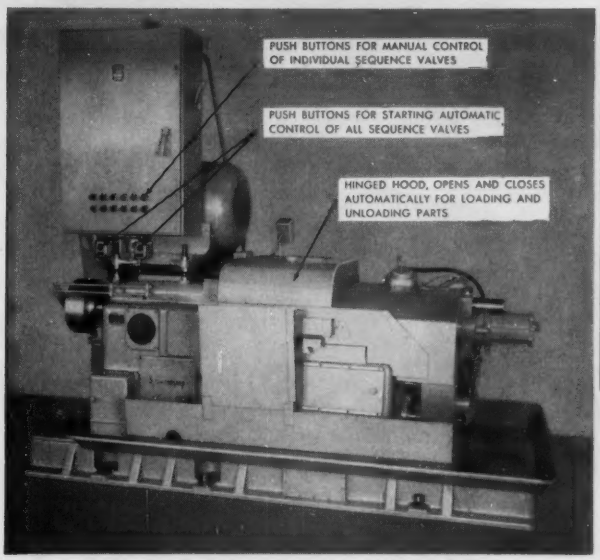
CITIES SERVICE

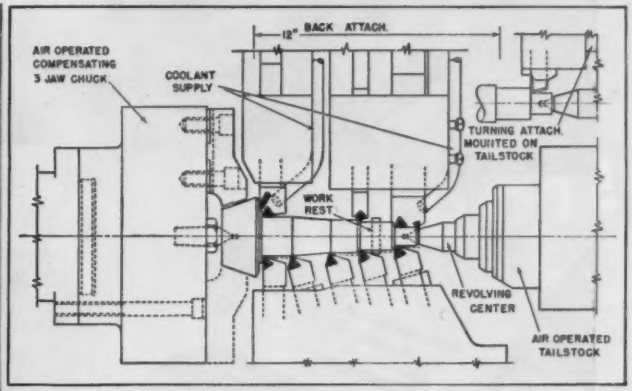
QUALITY PETROLEUM PRODUCTS

For more information on products advertised, use Inquiry Card, page 243

MACHINE OF THE MONTH

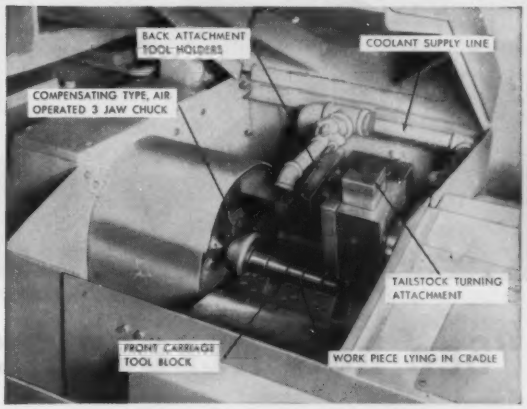
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





◀ *Tooling area of machine is entirely enclosed, protecting operator from flying chips and coolant.*

▼ *Hinged hood in open position for loading and unloading parts.*



Lo-swing LATHE EQUIPPED WITH AUTOMATIC CONTROLS REDUCES HANDLING TIME...

Problem: **To reduce handling time and operator fatigue in machining operations on Axle Pinions.**

Solution: **A Model AR Automatic Lo-swing Lathe, tooled as illustrated, was selected for this job. Work is held on centers and driven with an air-operated, three-jaw compensating chuck. Five carbide front turning tools, two of which are template operated, reduce the length of cut to 1-7/8", which is the length of the taper portion. An additional tool, mounted in a tailstock turning attachment, partially removes surplus material on the threaded diameter in advance of the front turning tool which finish turns this diameter. Six carbide tools on the rear slide face and chamfer the shoulders.**

The machine stops automatically at the end of the cycle with spindle stopped, chuck jaws released, tailstock center retracted, hinged hood open and with the machined part dropped into a cradle. The operator simply replaces the finished part with a rough forging and then pushes the two starting buttons, energizing the loader controls, which consecutively close the hood, places the work between centers, closes the chuck jaws and finally starts the headstock spindle rotation. The automatic cycle from then on is controlled by automatic camming built into the base machine.

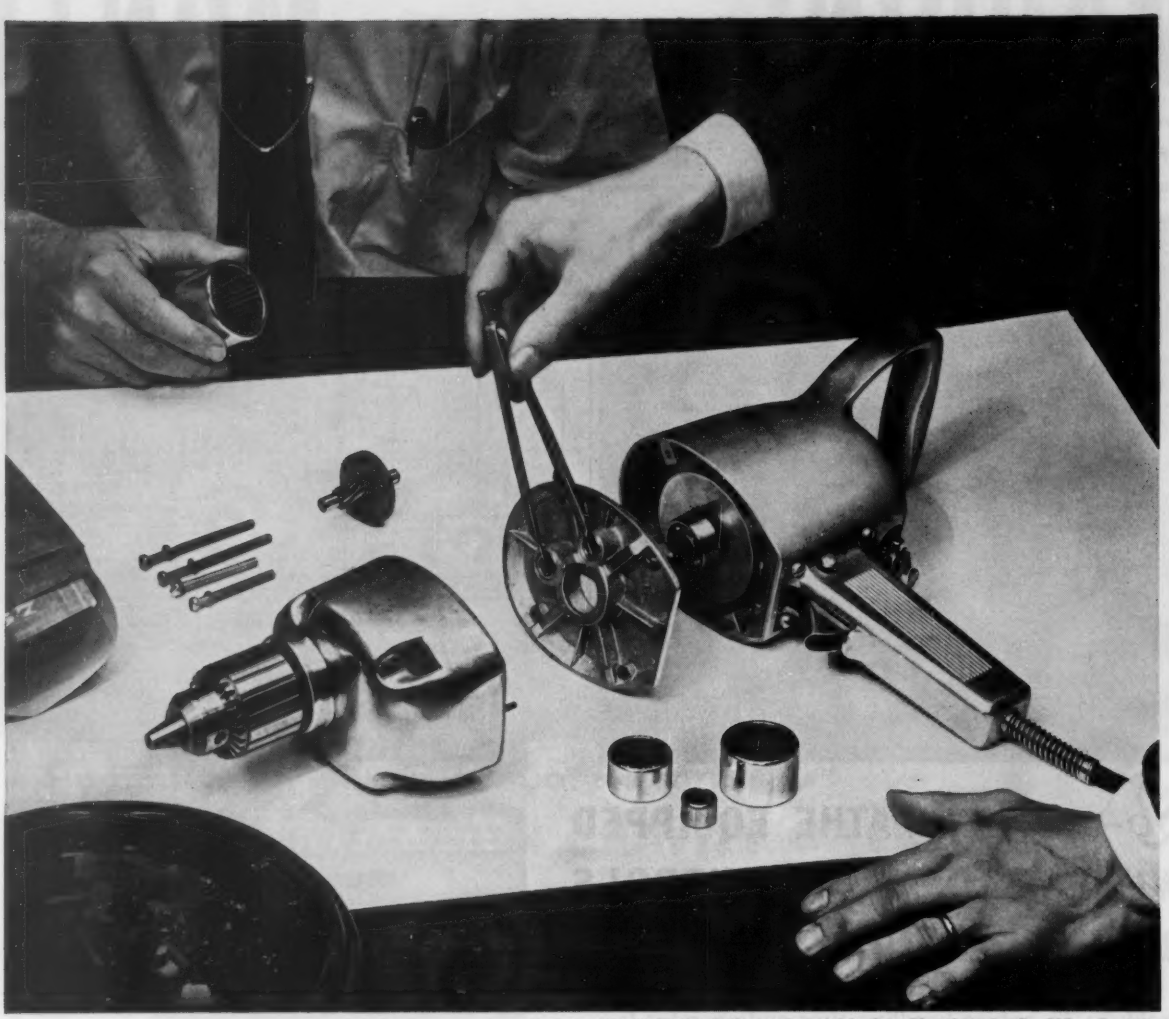
The tooling area of the machine is entirely enclosed to protect the operator from flying chips and coolant, while cutting at high spindle speeds. Two starting buttons, wired in series, oblige the operator to use both hands, and are so located that the operator is out of range of the closing hood, thereby preventing accidents.

Control buttons on the door of the starter panel permit normal operation of individual controls and are convenient for setting up and timing loader movements.

Seneca Falls engineering staff is at your disposal to help solve your engineering problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



Cummins Portable Electric Drill—product of John Oster Manufacturing Co., Milwaukee, Wis.

"See how NEEDLE BEARINGS Simplify Design"

Torrington DC Needle Bearings have a talent for simplifying complex design problems.

Because of their small size, housings and related members can be made smaller and lighter, shaft diameters can be increased for added strength, and smaller shaft-center distances can be employed.

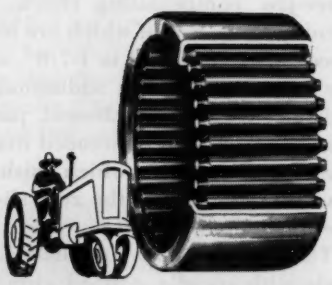
These benefits are a direct result of the Needle Bearing's unit construction. The drawn and hardened outer shell, when pressed into a recommended housing bore, serves as the outer race. A full complement of small-diameter rollers provides many lines of contact for high radial loading. What's more, a hardened shaft serves as a low cost, high quality inner race.

The turned-in lips of the Needle Bearing retain lubricants effectively and help insure long service life.

Why not incorporate these advantages into your product? Our engineering staff will be glad to help you with your anti-friction problems.

• • •

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.



Tractors, harvesters, combines, mowers and many other farm machines produced by leading manufacturers utilize Torrington Needle Bearings to good advantage. In main drives, crankshafts, gearboxes, idler pulleys, steering gears, hydraulic pumps and a host of other assemblies, Needle Bearings take the punishing loads of daily farm use.

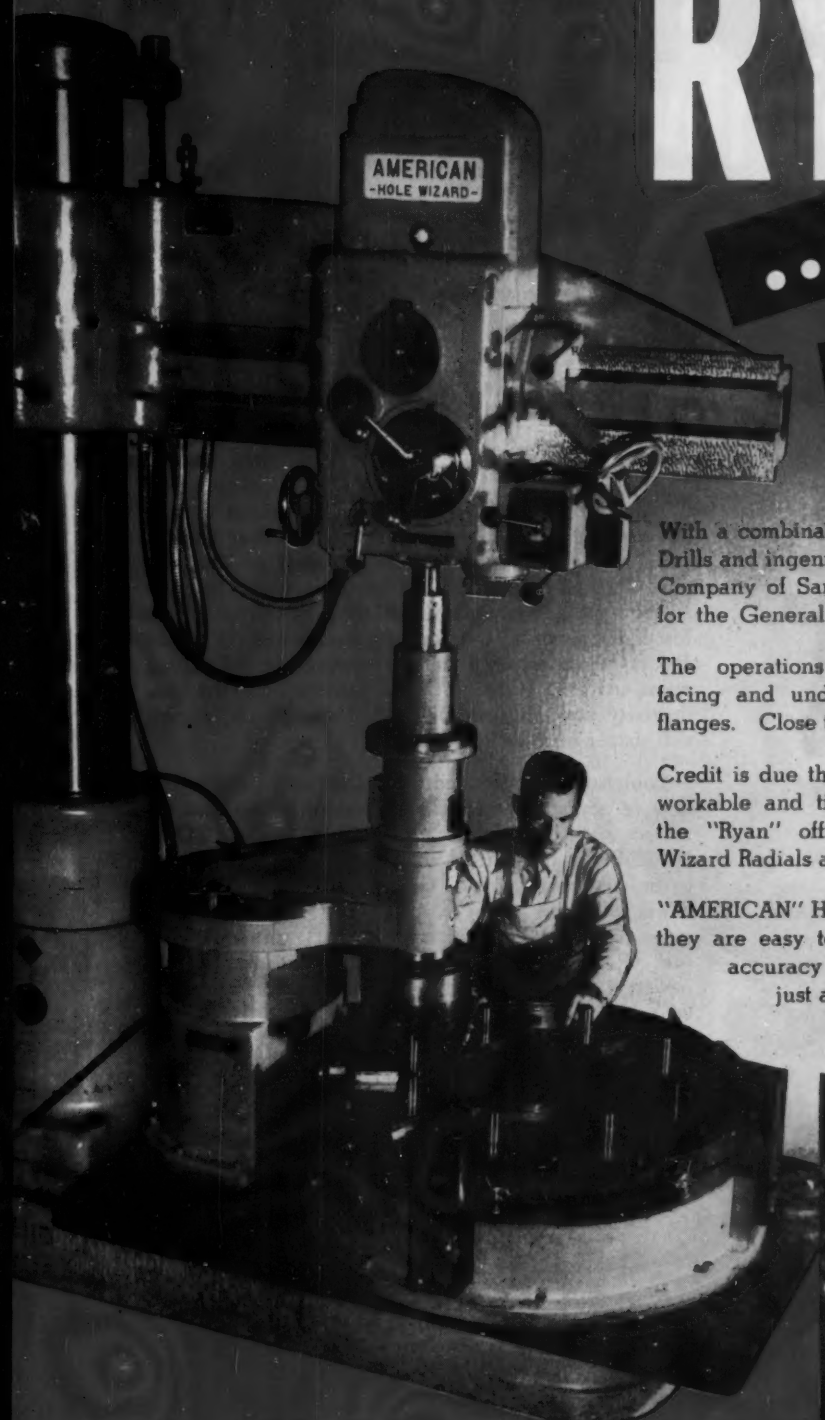
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

For more information on products advertised, use Inquiry Card, page 243

RYAN ...HITS THE JACKPOT!

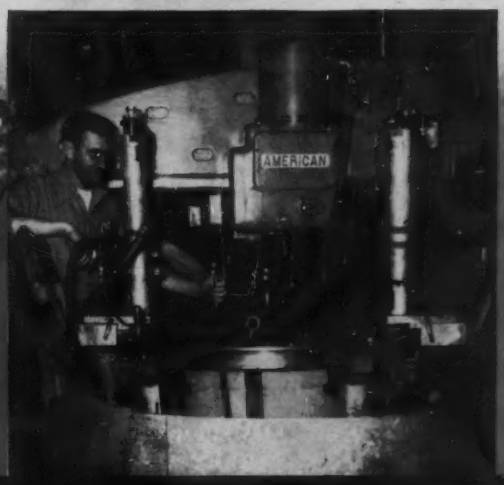


With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.



Bulletin No. 315
will give you the facts.

THE AMERICAN TOOL WORKS CO.

Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

ARMSTRONG



Use the Correct . .

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMALOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 WEST ARMSTRONG AVENUE • CHICAGO 30, ILLINOIS

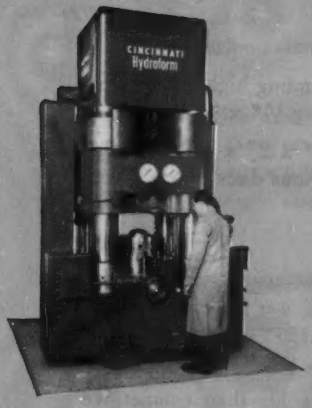
For more information on products advertised, use Inquiry Card, page 243

two more examples of time and tool cost savings by Hydroforming



▲ PART A: Hydroformed in one operation from a 23″ dia. blank of 0.051″ aluminum.

PART B: Hydroformed in one operation from a 19″ dia. blank of 0.032″ aluminum. ▼



The parts illustrated represent difficult, multiple-operation draws by conventional methods, using complicated and costly tooling. However, each part was produced in *one* draw by Hydroforming. *Minimum* tool cost was incurred. Part A was produced using a *plastic* punch. Part B was drawn with a *cast aluminum* punch. Two simple steel draw rings were the only other tool elements required. In both cases, finished part samples were submitted for engineering approval after just *two hours* development time on the machine.

Similar savings can be *yours* by Hydroforming. Let a Cincinnati Milling field engineer give you complete details. For a description of the Hydroforming process and specifications of the 8″, 12″, 19″, 23″, 26″ and 32″ machine sizes, write for Bulletin M-1759-3.

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

Here's why users are re-ordering Norton discs

Job reports show how disc grinding can be made more profitable with the money-saving "TOUCH of GOLD"

Typical reports from customers who re-ordered Norton discs

From Tennessee

Job: Wet grinding ends of universal joint spiders, case hardened steel, 58 to 62 R.C., ½" diameter. Rotary work carrier.

Report: Pair of Norton 22" x 2" x 14" discs produced 366,975 pieces without burn — outlasted and outperformed all other discs.

From Indiana

Job: Double disc dry grinding, 6" to 8" diameter cast iron rings, ¾" face, removing .015", .010" and .005" in 3 successive passes.

Report: Norton 30" x 2" x 3½" discs averaged 21,500 pieces, a new high for this job.

From Illipois

Job: Double disc wet grinding hot wound heavy duty coil springs. Reciprocating work holder.

Report: Norton 30" x 3" x 6" discs rated high above competition for output and grinding quality.

From Missouri

Job: Double disc wet grinding cast iron piston rings, roughing operation.

Report: Initial shipment of Norton 30" x 1" x 1" discs produced over 6,000,000 rings — 100% more than competitive discs, with 50% less dressing. Results duplicated in subsequent shipments, establishing Norton discs as best ever received.

From Kentucky

Job: Single disc grinding high-carbon steel inserts, dry grinding ½" x ¼" area.

Report: Norton 18" x 2" x 5" discs outproduced best previous discs 2 to 1.

From Michigan

Job: Tool room surfacing steel jigs and fixtures, single disc, wet grinding small to large areas, up to .125" stock removal.

Report: Norton 18" x 4" x 14" discs gave 20% longer service life than competitive discs.





Once Norton discs are tried, you can give odds that they'll be re-ordered. Freer, cooler cutting action, longer service life and increased production per disc are very good reasons why. Let's look at some other reasons:

- Norton discs are engineered to give best results over the entire range of disc grinding — from snagging to lapping, single or double surfacing, wet or dry grinding, large or small areas — on every type of disc grinder.
- They are made of the famous ALUNDUM* and CRYSTOLON* abrasives, in five bonds and all types of mountings.
- Their wide variety covers all materials ground by this method — metallic or non-metallic, ferrous or non-ferrous, alloys or machine steels, hard or soft.
- They are precision-built for uniform grinding action throughout their service life — from disc to disc and lot to lot.

Norton will engineer discs to your exact specifications — and duplicate these exactly on each re-order. It's the simple, logical way to put the profit-boosting "Touch of Gold" into your own disc grinding operations.

Your Norton Distributor

can give you valuable help in selecting the right discs for your jobs. Ask him for the new booklet "Disc Grinding." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1587

Making better products . . .
to make other products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

what's so different about

Piercing Color TV Chassis?

Color TV chassis are produced in small lots—require frequent engineering changes—setups and production tools are high cost operations.

THE WIEDEMANN RA-41P TURRET PUNCH PRESS economically produces chassis and panels in small lots for

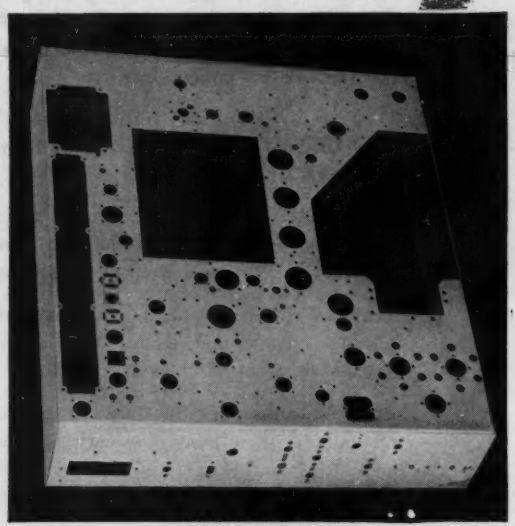
COLOR TV
RADAR
FIRE CONTROL
COMMUNICATIONS
BUSINESS MACHINES
AIRCRAFT

and many other applications

because:

- **Setup time is low**
- **Initial tooling cost is low**
- **Punches and dies are re-used on other jobs so tooling cost soon becomes a negligible factor**
- **Engineering changes are accomplished without delay to production schedules and at low cost**
- **Complete flexibility—close hole centers—20 hole sizes in sheets to 28″ x 40″ in single handling —40 to 60 holes per minute located to plus or minus .005″ tolerance**

These advantages combine to make the RA-41P Wiedemann Turret punch press a paying investment to all chassis fabricators, since the RA-41P is the only machine designed for economically piercing electronic chassis and panels in low runs.



COLOR TV BASE
Quantity 55
(Pierced on Wiedemann RA-41P)
530 strokes of press
31 different punches and dies used
(no special tools)
2 handling operations
TOTAL TIME (floor to floor)
per piece 16.25 MINUTES

Write for a copy of Bulletin 241

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

For more information on products advertised, use Inquiry Card, page 243

A new approach to ...PRECISION BORING



HIGHER PRODUCTION RATES—This Bryant Boring Machine produces uniform fine finishes—at peak production rates. It assures highest repetitive accuracy in precision boring, drilling, turning, facing, grooving and contour boring and turning.

The table is actuated by a simple cam and lever unit **A** which provides positive control of the cycle at all times. This mechanical actuation eliminates variation in the cycle due to temperature change.

FINER FINISHES—The Bryant 998 provides the smooth, uniform table motion so essential in generating a fine finish with a single point tool. The table moves on two 4" diameter solid steel slide bars **B** firmly bolted to the bed. The table is supported by two anti-friction preloaded ball bearings on each of these bars. This construction provides a metal-to-metal contact which eliminates shifting due to an oil film **C**.

MINIMUM DOWN-TIME—The Bryant 998 requires minimum servicing—motors, boring heads and slides are permanently grease sealed. Every unit is easily accessible.

SPECIFICATIONS—Total table stroke: 6"; Top of table to top of bridge: 4"; Width of bridge: 27⅜"; Multiple boring heads as required by tooling to a maximum of 4 (209) heads; Boring head motor: 5HP; Table dimensions: 17½" x 22"; Floor space (without coolant tank): 31" x 54".

Write today for complete details!

BRYANT Chucking Grinder Co.
SPRINGFIELD, VERMONT, U. S. A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

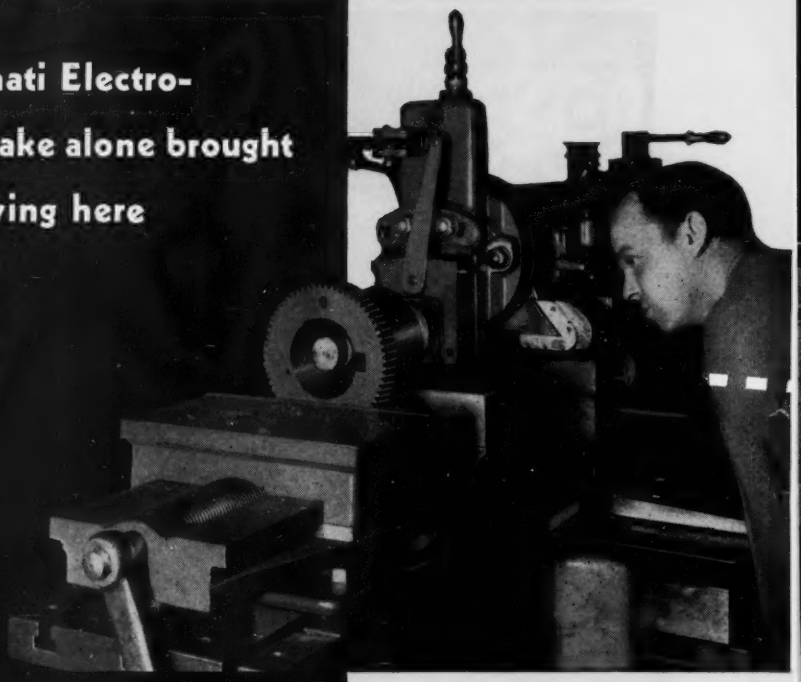
Internal Grinders • Boring Machines
Internal & External Thread Gages • Granite Surface Plates

20 REASONS WHY...

- Bed, bridge, table and heads are normalized Meehanite castings.
- Cam actuated table moves on preloaded ball slide bars.
- Cam is hardened and ground.
- Boring head spindles rotate in preloaded ball bearings.
- Air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- Boring head drive is completely accessible.
- Cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- Pad is provided at the rear for mounting accessory equipment.
- Push button controls are conveniently located.
- Manual, semi-automatic or fully automatic cycle.
- Emergency stop button instantaneously interrupts the cycle.
- Jog buttons on both front and rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.
- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and filling of the filter-lubricator unit in the pneumatic system.
- Ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- Boring head bearings are permanently grease sealed.
- Cam is easily accessible for changing the table stroke.
- Change gears are enclosed in their own wet sump, splash lubrication system.

Outstanding Time Saver...

The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-6.

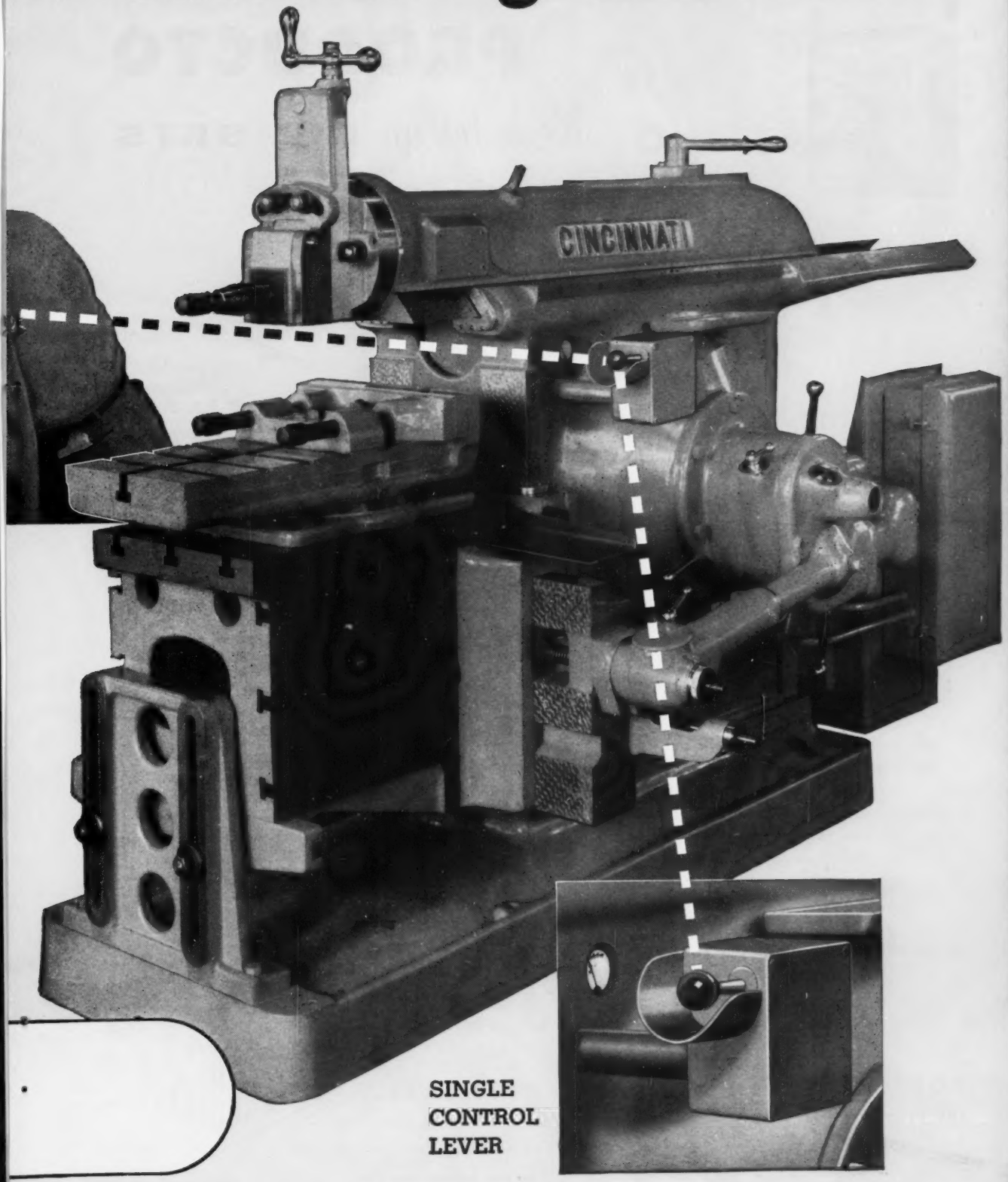
Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

....Outstanding ACCURACY



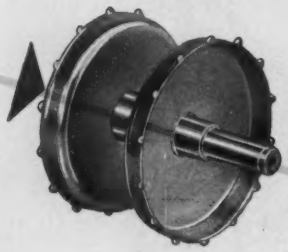
SINGLE
CONTROL
LEVER

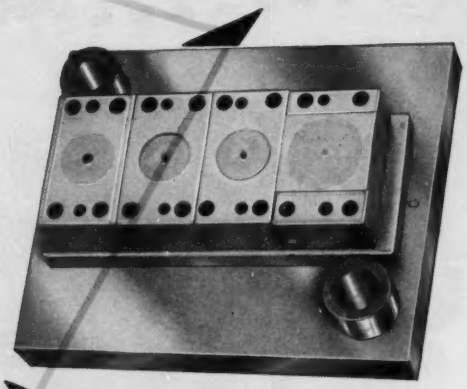
LUX CLOCK
keeps a date with

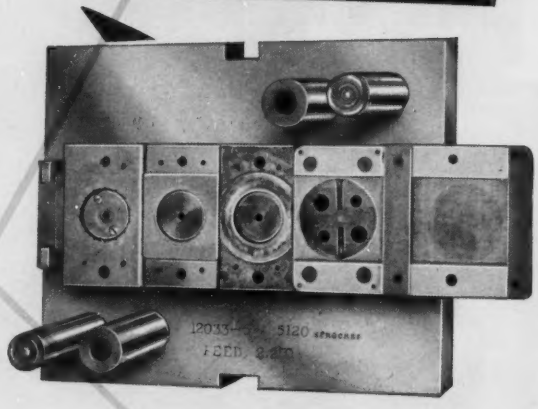
PRODUCTO

New design DIE SETS











In order for the date band on this Lux "date-minder" calendar clock to operate evenly and line up accurately, it is essential that the date drum sprockets, above, be concentric. This accuracy can be traced directly to the Producto die set which controls the stamping of this part. With a center hole tolerance of .001 and with a 6000-per-hour stamping speed, it is easy to see why the die set must be a highly precise, yet rugged, instrument.

Producto new design die sets combine precision machining and boring; close-tolerance, individual honing of pins and bushings; plus a "reserve strength" feature, into a carefully assembled and inspected product — your long-run guarantee of stamping accuracy and insurance against die breakage.

Whether catalog or special, every Producto die set is an instrument of precision.

For die set accuracy . . . call your nearest Producto branch.

FOR PRECISION DIE SETS FAST, CALL...

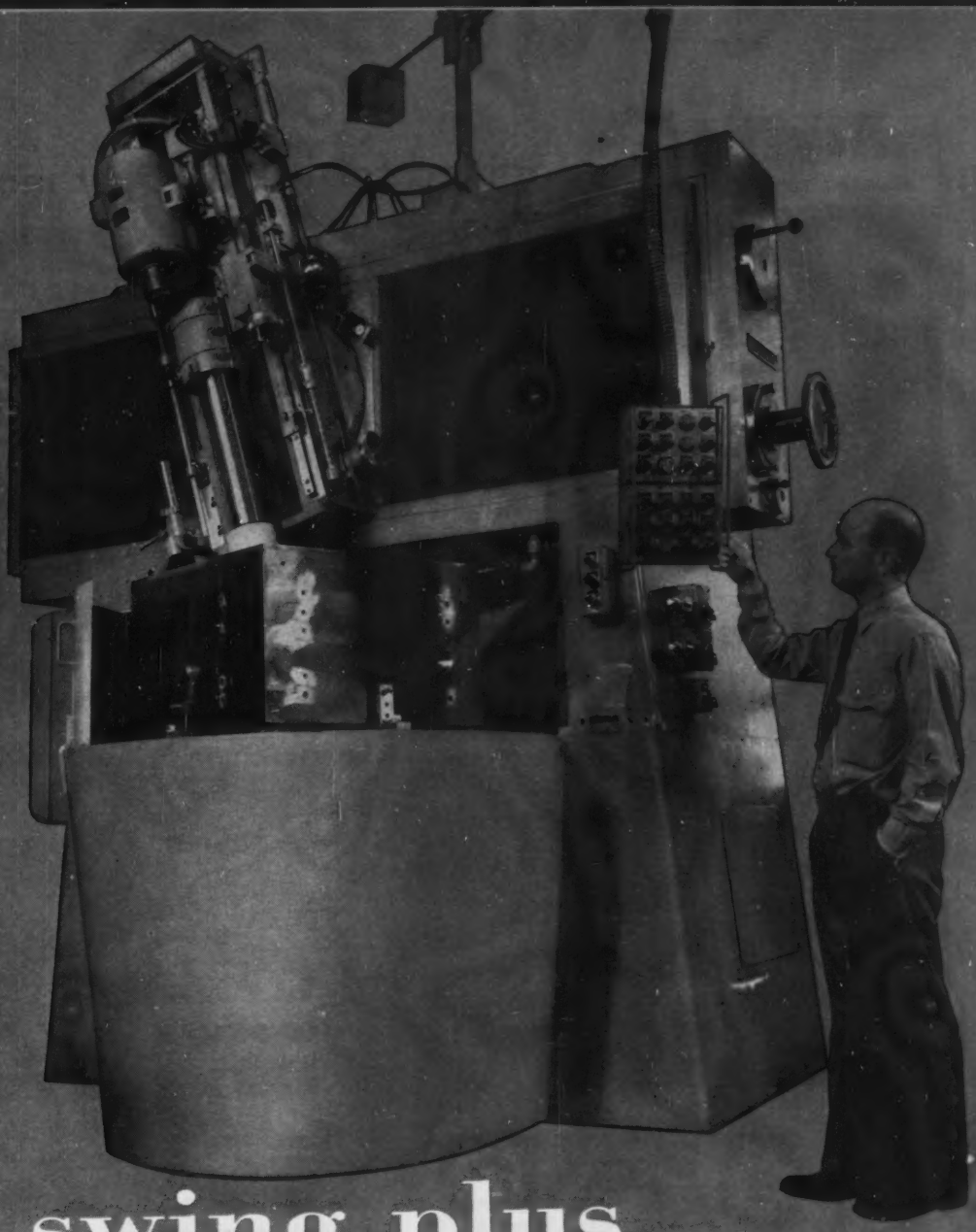
THE PRODUCTO MACHINE COMPANY • 985 Housatonic Ave., Bridgeport 1, Conn.

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY

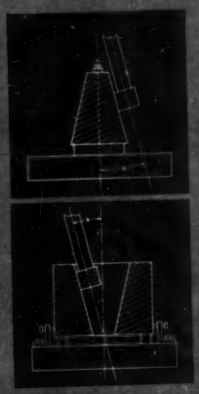
PRODUCTO

3PD54A

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52″ swing plus...



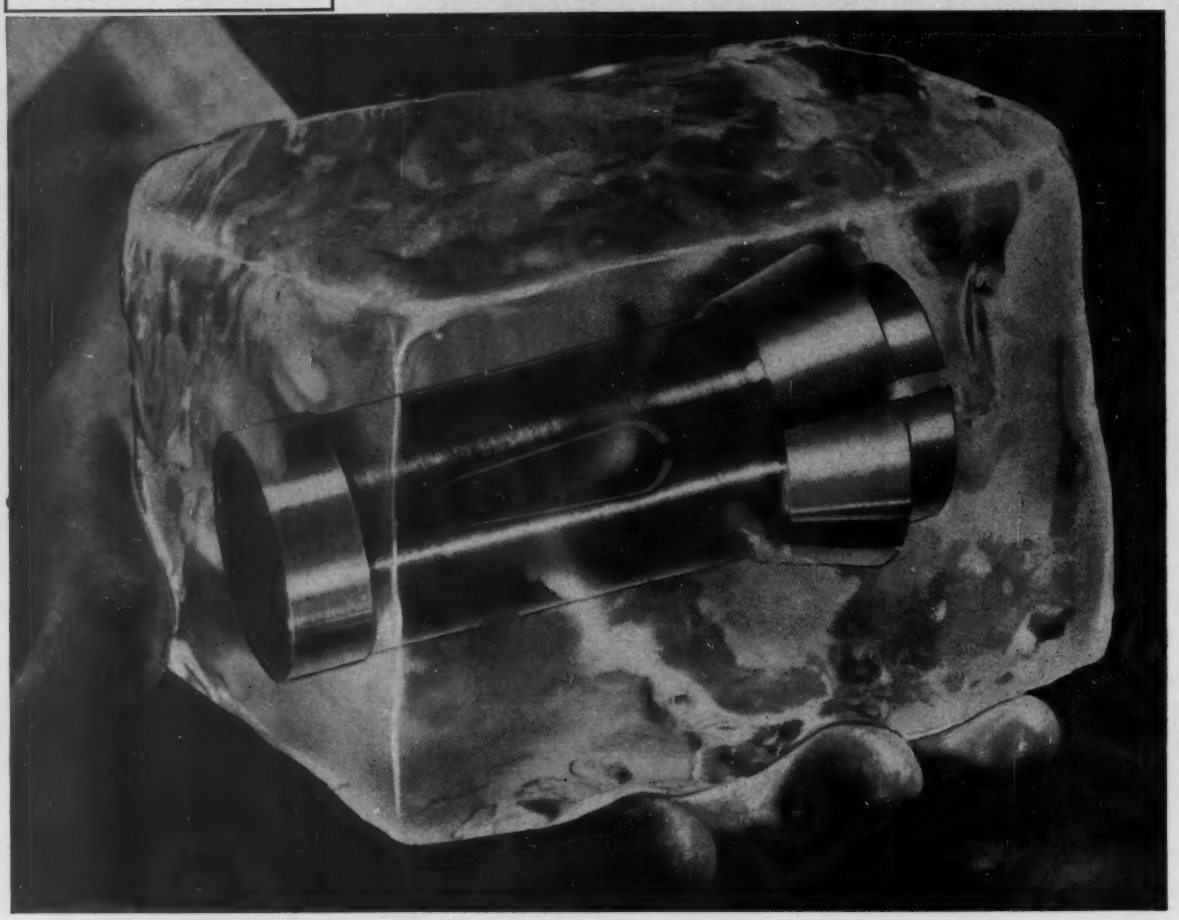
. . . plus 27½″ grinding head stroke, 24¾″ clearance over face plate, 42″ diameter face plate—on Springfield's new Vertical Universal Grinder. Work piece on the grinder here is a washing machine agitator mold, 43″ corner to corner. One angle setting of the head ground both male and female taper for a perfect fit. Hand-lapping them would take a week. Springfield's time: 4½ hours.

Other Springfield Vertical Universal Grinders—swings 21″ and 30″. Lathes—toolroom, engine, contouring, reproducing—14″ to 32″. Write for the name of your nearest Springfield dealer.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

ANTISEP
All-purpose water-soluble base

—fortified for heavy duty machining



Parts come off cool...when

ANTISEP
All-purpose water-soluble base

is on the job!

You needn't sacrifice topnotch lubricity—nor anti-welding properties—to get maximum cooling ability . . . ANTISEP Base is what you need. Especially in high speed machining.

ANTISEP water-soluble cutting base carries heat away *fast* . . . so fast that just-machined work can be handled barehanded! And it's fortified to provide exceptional lubrication as well.

Put ANTISEP to the test on your toughest metal cutting jobs—notice how tools keep free of chip build-up—how parts come off with a finish to make any machinist proud!

Ask your Houghton Man . . . or write to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. . . . to arrange a trial production run in your plant.

ANTISEP
all-purpose water-soluble
CUTTING BASE
. . . a product of

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO



Ready to give you on-the-job service . . .

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NEW

JONES & LAMSON

MODEL FC-30 OPTICAL COMPARATOR

with Electronic, Variable Speed Vertical Measuring Control



Easy, close access to 30″, eye level screen
New brilliant surface illuminator

Thirty-five years' experience in developing optical comparators—16 years' experience with 30″ viewing screens—has gone into making this ultra-modern precision inspection machine.

Built to highest machine tool standards, its wholly integrated design allows the operator to view the entire screen at close range while making quick, accurate measurements.

Electronic, variable speed vertical measuring control allows the work piece to be raised or lowered, slowly or rapidly to the exact measuring point desired. Imagine — quick, precise measurements to .0001″, in one motion, with fingertip pressure.

The FC-30 also has these additional *exclusive features:* 5″ and 8″ diameter capacity with easy change-over; 6″ projection lens optional; carbide tipped micrometers graduated for direct reading in either direction, combined with micrometer zeroing anvil; measuring dial illuminators.

Available for immediate delivery.

P.S. *Write today for folder containing complete information.*

JONES & LAMSON

World's largest manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A. **OPTICAL COMPARATOR DIV.**

If there's a better way to bore...Davis does it!

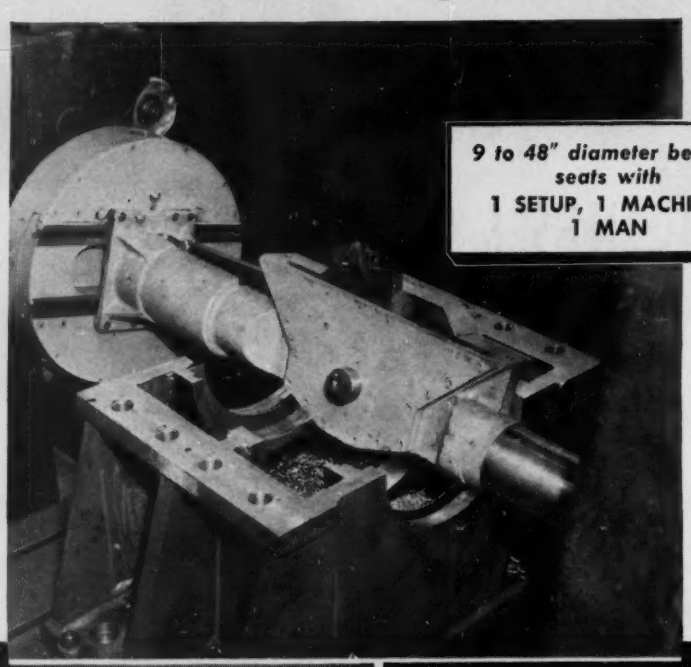
NEW spherical boring tools cut machining time, maintain closer tolerance, improve finish

--3 fast ways!

Here's another profitable operation performed by a Davis spherical boring tool, mounted on a continuous feed facing head. These special tools are currently being used in machining 9" to 48" bearing seats of pedestals and caps. High-speed steel and tungsten-carbide cutting tools are used.

As reported by a large electrical equipment manufacturer, the new tool has considerably reduced floor-to-floor time and tool breakage. What's more, it maintains closer tolerances and produces a better finish than was previously possible. The Giddings & Lewis continuous feed facing head, used to drive the spherical tools, is also used to complete all facing, straight boring and grooving on the same setup. Formerly, multiple setups on various machines were required.

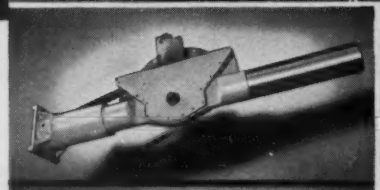
If you've a spherical boring problem, chances are one of the three types of Davis tools shown below is the answer.

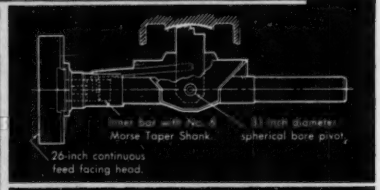


9 to 48" diameter bearing seats with
1 SETUP, 1 MACHINE, 1 MAN

1. FOR LARGER WORK—24 to 48" bore range

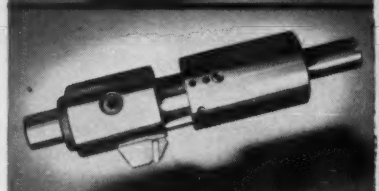
Spherical motion of block-type cutter is produced through the simultaneous action of tool rotation and spindle advance. Spindle arms and swinging arms are mechanically linked. Covers these ranges: 24 to 31", 31 to 39" and 39 to 48" in diameter.

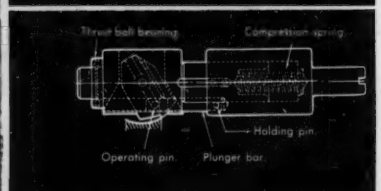




2. FOR MEDIUM WORK—8 to 12" bore range

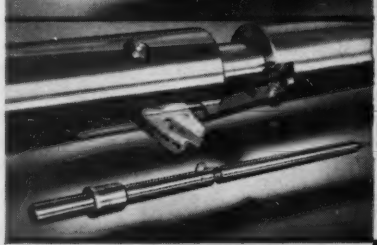
This tool is actually a bar within a bar. The cutting block is positioned by the ball thrust bearing contacting the face of the lathe spindle. Motion of outer bar relative to inner bar moves the block-type cutter through a spherical path.

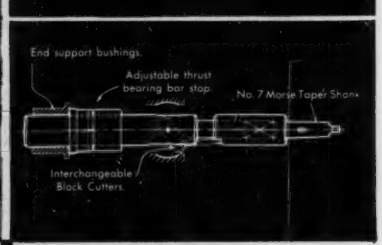




3. FOR SMALLER DIA.—8 to 13" bore range

An adjustable stop collar that registers on the face of the end support bushing can be clamped anywhere along the bar. The collar positions cutter on the center of the proposed bore. Bar rotation and spindle advancement move cutter through an arc to produce the spherical bore.





What's your boring problem?
Davis offers you a complete tooling service to solve any routine or extraordinary boring problems. NEW spherical boring tool and complete Davis line are described in Catalog 304. Send for a copy today.



REMEMBER — If there's a better way to bore it — Davis will know it. And if Davis can't bore it — it can't be done!

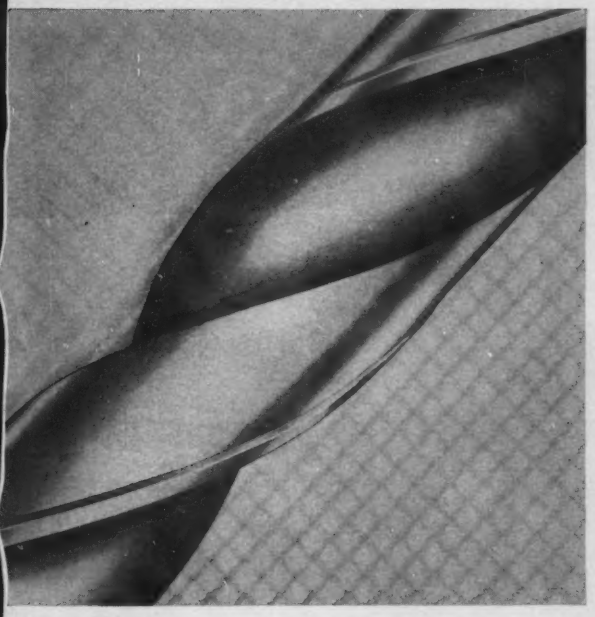
DAVIS
BORING TOOL DIVISION
OF GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

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DESIGNED, ENGINEERED

Designed, engineered and produced for maximum performance — Butterfield Drills.



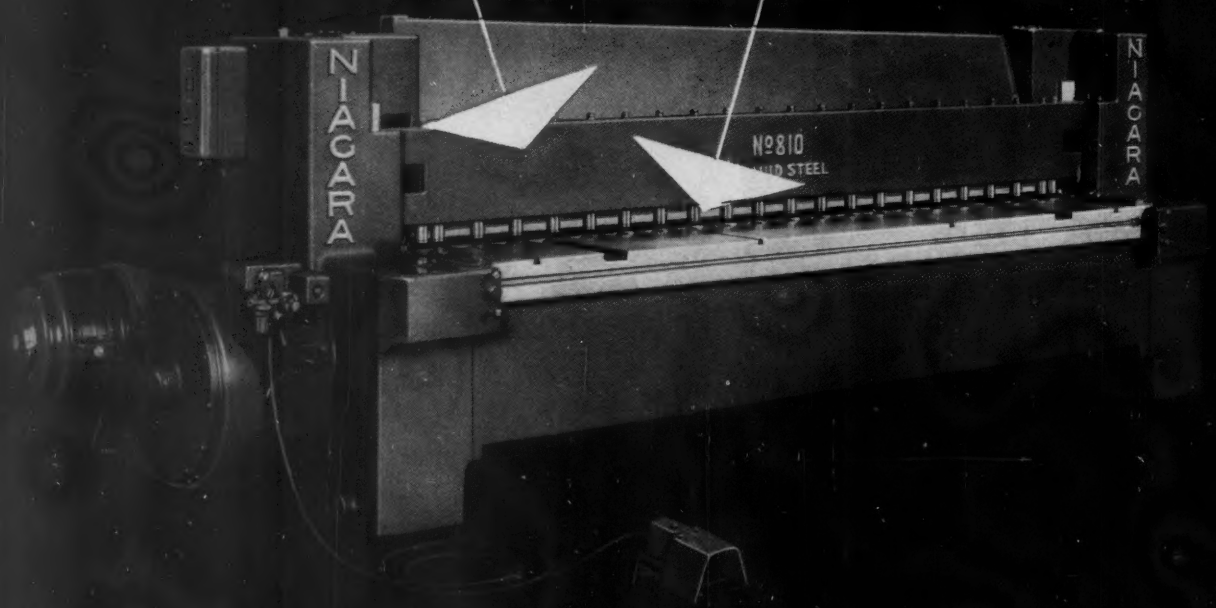
BUTTERFIELD

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U. S. A.

TAPS • DIES • DRILLS • REAMERS • COUNTERBORES • SCREW PLATES

FOR BETTER SERVICE
Call Your
BUTTERFIELD
DISTRIBUTOR

SELF-COMPENSATING HOLDDOWN



NIAGARA
MACHINE & TOOL WORKS
1879 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

a BIG FACTOR in the superiority of Niagara Shears



"STRAIGHT-EDGE" CUTTING ACCURACY
Positive, power actuation grips work securely for maximum cutting accuracy.

LOW IMPACT AVERTS DAMAGE AND INACCURACY
Individual pressure feet contact work with low impact, thus safeguarding both the material and bed against damage, as well as reducing noise level. No hammer-blows to mar work. No peening of bed with resulting distortion of knife seat.

SIMPLIFIED, LOW UPKEEP DESIGN
Simplicity of design and construction, involving a minimum number of parts, assures negligible servicing. With *less* to go wrong, there is *less* to repair and replace.

HOLDS WORK FLAT AND STATIONARY
Multiple pressure feet on 6" centers, applying uniform pressure, hold work flat and tight against bed to assure utmost shearing accuracy. No rippling of sheet between feet as cut progresses. Firm grip on short pieces.

HANDLES STOCK OF VARYING THICKNESS
Individual feet are self-compensating, requiring no adjustment for cutting stock of different thicknesses . . . *even at the same time.*

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Detroit • Cleveland • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

In a power squaring shear, no *single* feature nor component can be fully responsible for accuracy, speed and economy. *They* result from a *combination* of features such as the self-compensating holddown; rigid, fully closed box section construction of bed and crosshead; low slope of upper knife; ample and accurately held crosshead guides; multiple point sleeve clutch —the very features that have established the marked superiority of Niagara's Underdrive Series.

For the whole story, straightforwardly presented, on America's most complete line of underdrive power squaring shears, with capacities from shim stock to 1 in. thick mild steel (lengths 3 to 20 ft.), request *Niagara Bulletin 69*. Write today.



NIAGARA

UNDERDRIVE SQUARING SHEARS

NEW and BETTER!

PARALLOC
DIAL SNAP GAGES

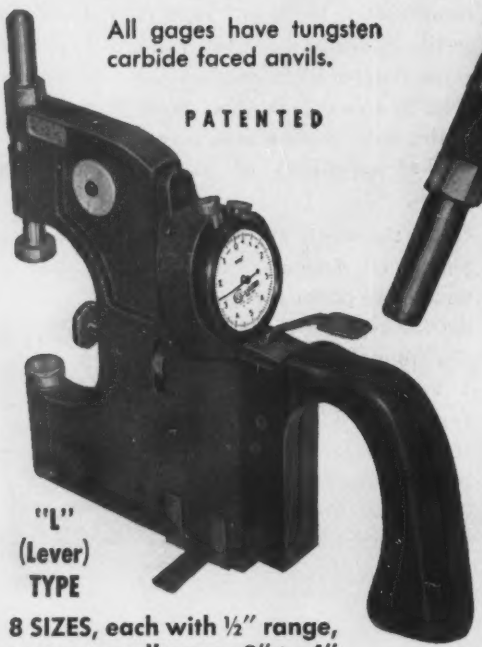


PARALLELISM PRESERVED

STANDARD'S new PARALLOC Dial Snap Gages introduce a new type of locking mechanism which maintains remarkably close parallelism between the anvil faces. Ordinary locking mechanisms tend to distort a portion of the frame in a way which swings the pin faces out of parallelism to a degree which is substantial in relation to close tolerances. In PARALLOC, the metal is merely squeezed *along the line of the pin axis,* leaving the parallel condition undisturbed throughout successive relockings of the anvil. *You can rely on parallelism with PARALLOC!*

All gages have tungsten carbide faced anvils.

PATENTED



"L" (Lever) TYPE

8 SIZES, each with ½" range, cover overall range 0" to 4"

"D" (Direct) TYPE

8 SIZES, each with 1" range, cover overall range 0" to 8"

★ **PARALLELISM of anvils maintained, unaffected by tightness of clamping.**

★ **CHOICE OF INDICATORS . . . any AGD indicator in sizes 1 or 2, with desired dial graduations.**

★ **TRIPLE PROTECTION; Protective indicator guards; "Capstan" sleeve acts as stop to keep gaging plunger within range of indicator, preventing distortion of indicator mounting; STANDARD's fully shockproof mechanism within indicator protects gears from damage.**

★ **ANVILS OVERHANG frame slightly to allow gage to be entered into narrow places and close to a shoulder.**

INDICATOR POSITION permits easy entry of gage into narrow recesses. Advantageously placed for observation.

FULLY ENCASED MOVEMENT AND INDICATOR protected against accidental damage.

CLIP-ON STAND holds gage firmly upright.

WRITE for new booklet, "NEWS", describing these and other new STANDARD developments.

STANDARD Gage Co., Inc.
Poughkeepsie, N.Y.

For more information on products advertised, use Inquiry Card, page 243



AMERICAN MACHINE & FOUNDRY COMPANY
Machine Tool Replacement Program

by MR. MOREHEAD PATTERSON,
Chairman of the Board
AMERICAN MACHINE & FOUNDRY COMPANY

"AMERICAN MACHINE & FOUNDRY COMPANY and its subsidiaries manufacture a widely diversified line of products. Machine tools of every type and capacity are utilized in our many manufacturing facilities. To meet the need for ever increasing accuracy and quality at lowest cost, it is essential that these facilities be kept at their peak of efficiency. Our machine tool replacement program is designed with this in mind.

"Accurate maintenance records are kept on each piece of equipment from the date of its installation. When it becomes apparent that maintenance costs on a machine tool are becoming excessive, it is tentatively scheduled for replacement. At the same time, our supervisory staff is constantly conducting a research on savings that can be gained through the use of new machine tools. The two factors are coordinated and the economics of replacement are then weighed through the use of the MAPI formula which serves to give proper weight to each factor involved in replacement, independent of possible personal bias.

"Recommendations for new equipment are submitted by each plant to an Advisory Committee composed of top management personnel, located at the company's New York headquarters. Approval to purchase a new machine tool does not relieve the plant management of responsibility for justifying the wisdom of the decision. Accurate records are kept at the foreman level in each plant, tabulating the monetary and quality savings made possible by the new machine. These records are reported back to the Advisory Committee and serve as guidance in making future decisions."

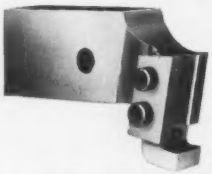
ROCKFORD
INSERT
GROUP

Keep Gathering Metal-Working
Production Ideas . . . Be Well
Informed When The Time
For Replacement Arrives . . . . .

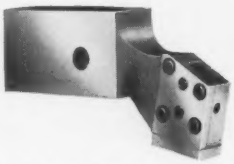
GREENLEE *Automatics*



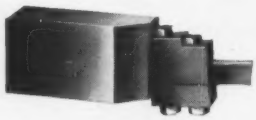
Circular Form-Tool Holder



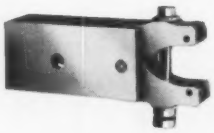
Dovetail Form-Tool Holder



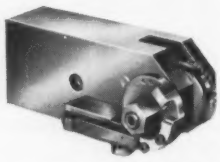
Bit-Type Form-Tool Holder



Cut-Off Tool Holder

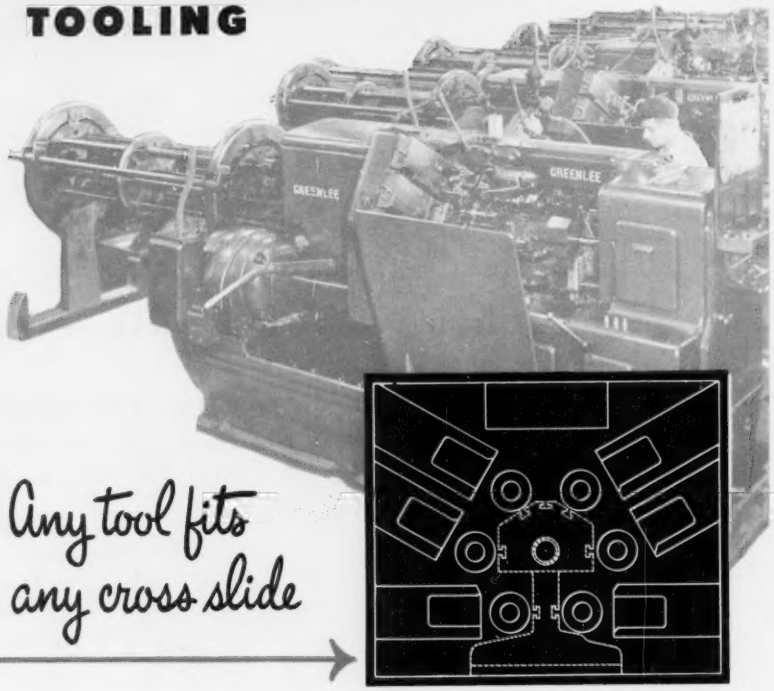


Knurling Tool Holder



Stencilling Wheel Holder

INTERCHANGEABLE TOOLING



Any tool fits any cross slide

SAVE TIME AND MONEY REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE Literature



Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

PRODUCTION MACHINERY

GREENLEE

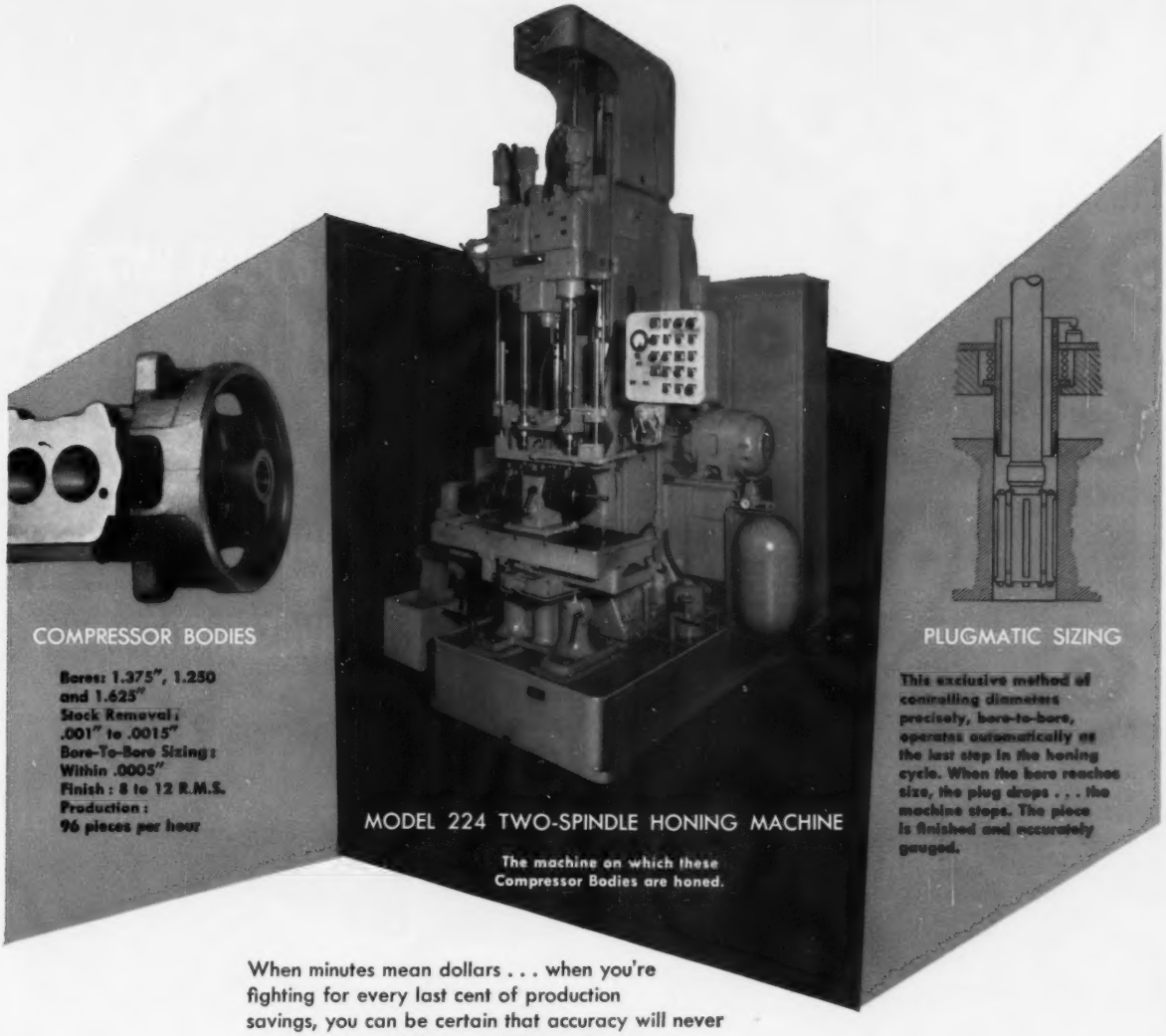
GREENLEE BROS. & CO.
1870 MASON AVE., ROCKFORD, ILL.



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

Accuracy Never Varies with BARNESDRIL Honing Equipment

whatever the production rate



COMPRESSOR BODIES

Bores: 1.375", 1.250 and 1.625"
Stock Removal: .001" to .0015"
Bore-To-Bore Sizing: Within .0005"
Finish: 8 to 12 R.M.S.
Production: 96 pieces per hour

MODEL 224 TWO-SPINDLE HONING MACHINE

The machine on which these Compressor Bodies are honed.

PLUGMATIC SIZING

This exclusive method of controlling diameters precisely, bore-to-bore, operates automatically as the last step in the honing cycle. When the bore reaches size, the plug drops . . . the machine stops. The piece is finished and accurately gauged.

When minutes mean dollars . . . when you're fighting for every last cent of production savings, you can be certain that accuracy will never be sacrificed with Barnesdril Honing Equipment. The truth is, it *can't* be sacrificed, whatever the output.

In finishing these Compressor Bodies, Plugmatic Sizing is part of the actual honing cycle . . . *not* an extra operation. No matter how production rates are increased, accuracy never suffers by the speed-up. Plugmatic Sizing is in there at all times, working to protect Quality Control standards . . . insuring bore-to-bore identity and complete interchangeability.

Ask your Barnesdril Honing Engineer to show you how Plugmatic Sizing can give you accurate bore-to-bore measurement on a repetitive operation. He'll also tell you about Electronic Hone Expansion Control and "Extra-Deep" Plas-T-Clad abrasive stones . . . two other Barnesdril features that help reduce production costs.

HOLE BARNESDRIL FINISHING

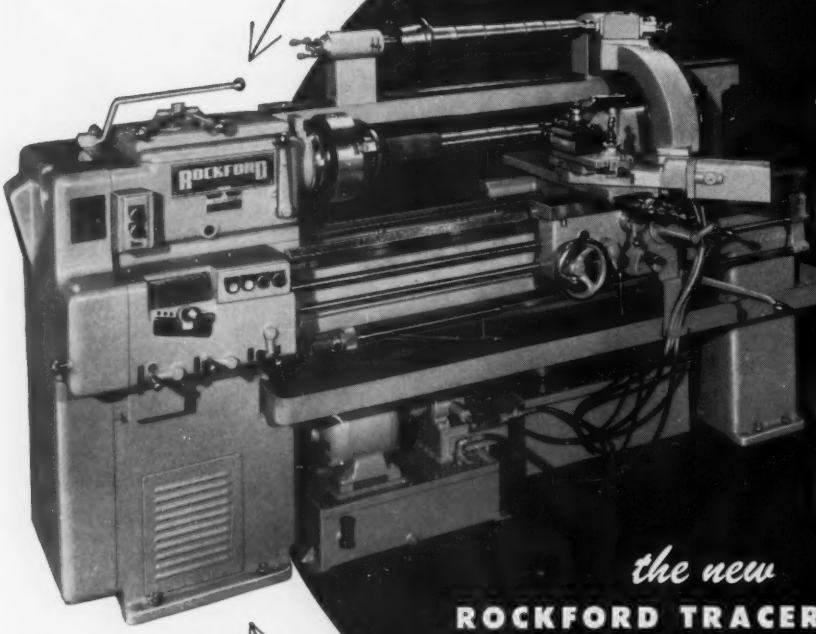
BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



ROCKFORD MEDIUM-SIZED ECONOMY-PRICED DOES IT AGAIN!



the most value in a tracer-lathe - with medium capital investment

the new

ROCKFORD TRACER-LATHE

combines famous Rockford Features

with

Be sure to see this new production tool in operation. Witness the unusual accuracy and speed with which it cuts. Feel the ruggedness and power built into the Kopy Kat with the extremely sensitive feather-touch of the servo-mechanism control. Yet the cutting tool works with 400 lbs. unit pressure for positive finish and accuracy.

See your Rockford Machine Tool Co. representative today and have him arrange an appointment for you to see the new Rockford Tracer Lathe in action.

- Unusual Tracer Sensitivity and Accuracy
- Overhead Tracer Control Uses Either Production Sample or Flat Master
- Self-contained, Easily Accessible Hydraulic Unit
- Universal Cutting Slide with Positive Lock-Out for Manual Cutting
- Four Position Turret Tool Post on Compound

ROCKFORD ECONOMY LATHES

6', 8', 10', 12' BEDS

18" Swing

MEDIUM-SIZED ECONOMY-PRICED

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET, ROCKFORD, ILLINOIS



CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

Now! By Demand...

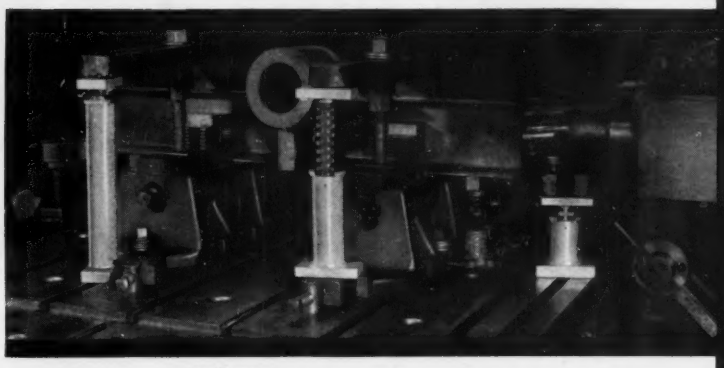
INGERSOLL CLAMP POSTS

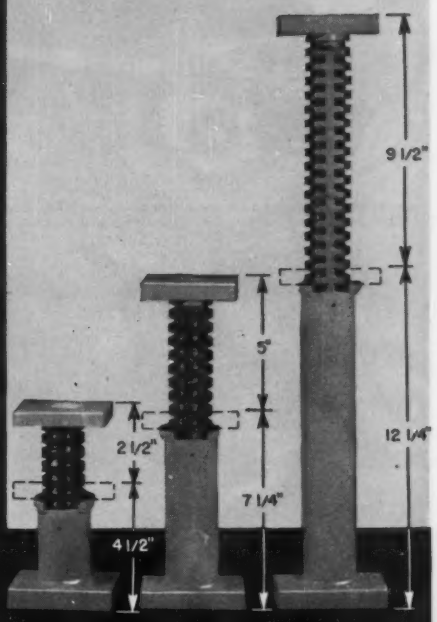
TO REDUCE MACHINE SETUP TIME

Due to repeated requests by machine-shop men, Ingersoll Adjustable Clamp Posts are now being produced and are immediately available from stock at low cost.

Ingersoll Clamp Posts provide rigid support for hold-down clamps, reducing machine setup time for a wide range of milling, boring, planing and drilling operations. Suitable for almost all types and kinds of machines, they eliminate use of makeshift, inefficient setup equipment. Originally developed for Ingersoll's own plant, they have been thoroughly tested and improved during several years of use.

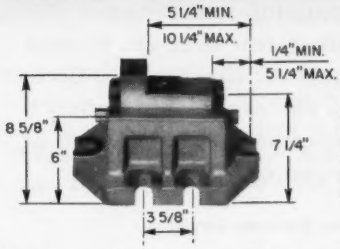
Other Ingersoll setup aids now being manufactured include Ingersoll Chuck Jaws, which hold work securely in position during machining, and Ingersoll Raising Blocks, specially designed to provide a firm, stable footing for workpieces.





4" SIZE	7" SIZE	12" SIZE
$8.50	$12.00	$15.00

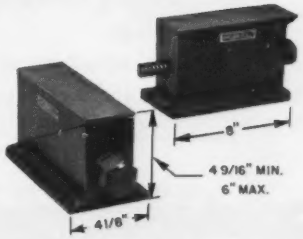
Ingersoll Clamp Posts are made in these three standard sizes. Information on other sizes will be sent upon request. Easily adjustable, they have ½" increments and are raised by simply lifting and turning the stem.



OTHER INGERSOLL MACHINE SETUP AIDS

INGERSOLL CHUCK JAWS
Standard Size as Shown, $135 Each . . . also Made to Meet Special Requirements at slightly Extra Cost.

INGERSOLL RAISING BLOCKS
Standard Size as Shown, $65 Each.



Send your order for Ingersoll Clamp Posts, Chuck Jaws and Raising Blocks today to The Ingersoll Milling Machine Company, Dept. B, 2401 Douglas St., Rockford, Ill.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U. S. A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**



NEW! Automatic Multi-Cycle Tracer Control for SUNDSTRAND Automatic Lathes*



Gives Ruff, Semi-Finish and Finish Cuts in ONE AUTOMATIC CYCLE

You can now obtain Sundstrand Automatic Lathes with tracer control for multi-cycle single point turning of irregular shapes. The lathes can be provided with a template controlled tracing slide mounted to the regular front carriage.

With this attachment and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in one automatic cycle. The control can be set up for one, two or three cycles depending on job requirements. The regular cross feeding rear slide can be used to square up shoulders, chamfer, etc. Cycle changing is quick and easy requiring only 5 to 15 minutes depending on the number of facing tools required in the job set-up.

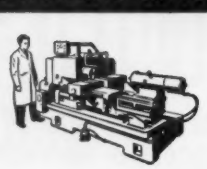
* This attachment is available for factory installation only on new Sundstrand Automatic Lathes.

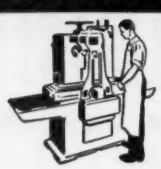
SUNDSTRAND

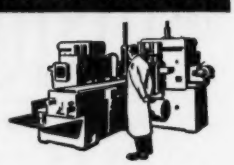
"Engineered Production" Service*

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





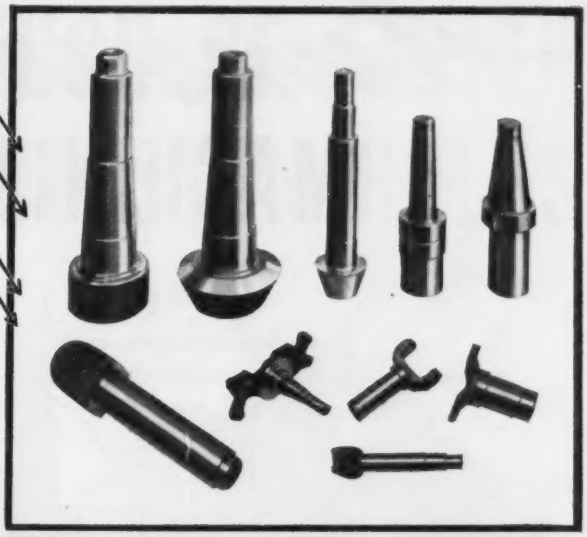




CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

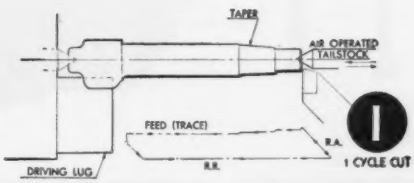
For Parts Like These

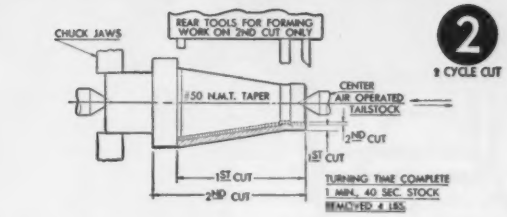
Illustrated at the right are typical parts that can be turned on a Sundstrand Automatic Lathe with the new Sundstrand Multi-Cycle Tracer Control. The pinions, stub arbors and universal joint parts illustrated are just a few of many that can be turned efficiently on this equipment. The diameters and tapers are turned with simple single point tools. Small lots or large can be handled easily and quickly.

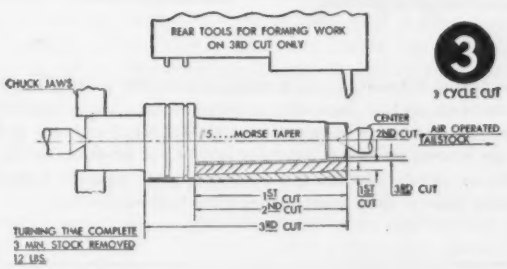


Typical Tooling

These sketches illustrate stock removal and tooling for a one cut, two cut or three cut job. The lengths and depths of the first, second and third turning cuts and the cross feed of the rear slide are automatic and part of the machine cycle. Changing over to a different job is easily done in a matter of minutes.







Features

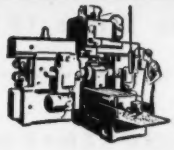
1. Easily changed over for different jobs. 2. One template for all three cuts. 3. Change-over time to standard operation approximately 45 minutes. 4. Three turning cuts in one automatic cycle. 5. Cross feeding rear slide operates in automatic cycle for facing, grooving, chamfering, etc. 6. Because of the complete automatic cycle one operator can run several machines.

Free Data

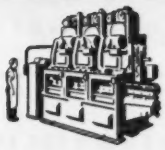
Additional information is available in this new folder. Write for your copy today. Ask for bulletin No. 648.



TRIPLEX RIGIDMILS



SPECIAL MACHINES

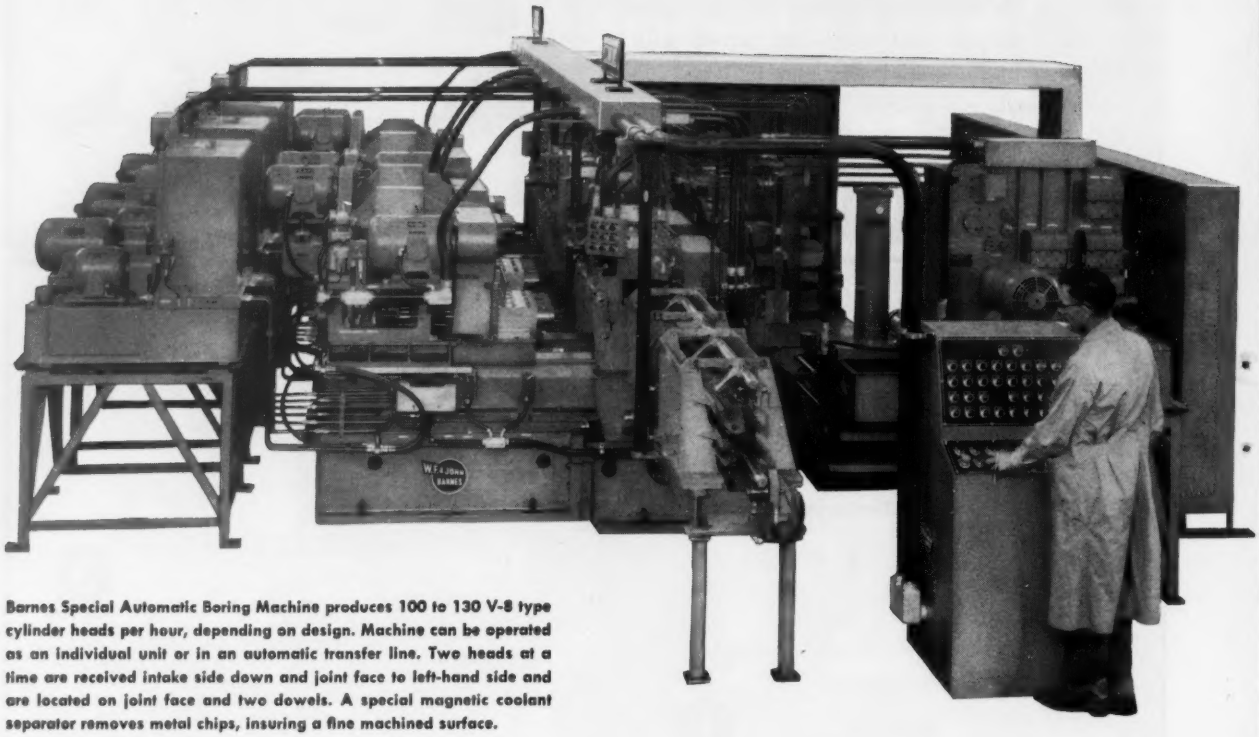


SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

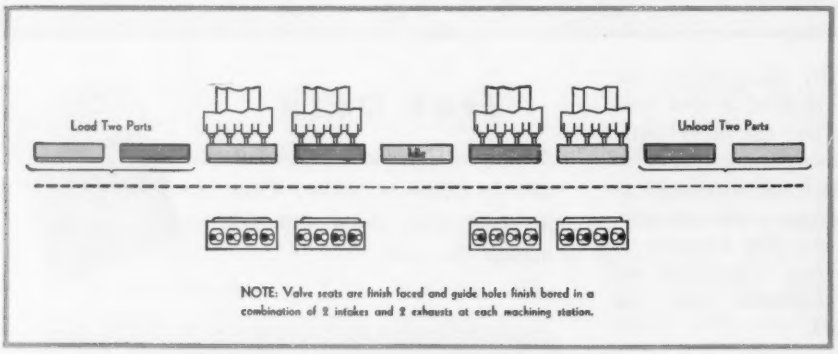
FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



Announcing NEW MACHINING AUTOMOTIVE

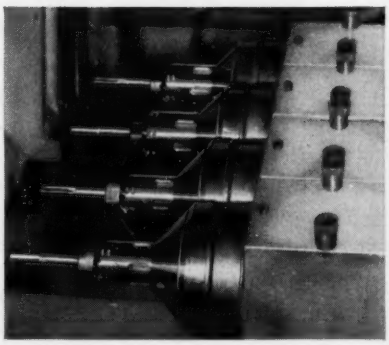


Barnes Special Automatic Boring Machine produces 100 to 130 V-8 type cylinder heads per hour, depending on design. Machine can be operated as an individual unit or in an automatic transfer line. Two heads at a time are received intake side down and joint face to left-hand side and are located on joint face and two dowels. A special magnetic coolant separator removes metal chips, insuring a fine machined surface.



NOTE: Valve seats are finish faced and guide holes finish bored in a combination of 2 intakes and 2 exhausts at each machining station.

Schematic drawing of machine above showing tooling and machining operations. Color blocks illustrate how cylinder heads are transferred two at a time.



Closeup of 4-spindle head with special tools for machining four valve seats and stem holes in one pass. Second 4-spindle head completes remaining operations.

W. F. & JOHN BARNES

Builders of Better Machines Since 1872

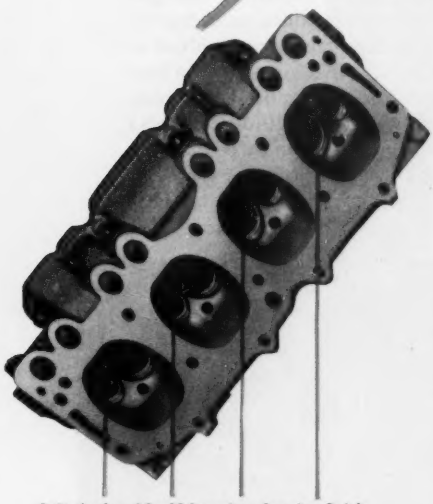
MULTIPLE SPINDLE DRILLING • BORING • TAPPING



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

PRECISION METHOD OF FINISH VALVE SEATS AND STEM HOLES

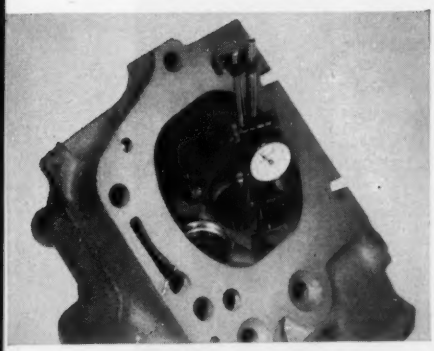
Automatically



Cylinder head for V-8 engine showing finish machined valve seats and guide holes. Red arrows indicate operations performed at first machining station.

EXCLUSIVE W. F. & JOHN BARNES MACHINING DEVELOPMENT HOLDS TOTAL CONCENTRICITY WITHIN .0005″

Now, a new precision machining method developed exclusively by W. F. & John Barnes makes it possible for you to finish machine automotive valve seats and stem holes on a continuous automatic basis. You can now eliminate corrective operations after normal boring, reaming, and seating operations, because this new development holds total concentricity within .0005″ (total indicator reading). This new machining process, as incorporated into Barnes Automatic Progress-Thru Type Machines, consists of multi-blade tooling for the valve seating operations, combined with modified gun drilling tools for precision boring valve guide holes. Production tests show the valve seat tools produce 10,000 to 15,000 parts, and the boring tools, between 2,500 and 4,000, before regrinding or replacement is necessary. The net result has increased production efficiency and improved product quality at lower cost. Write for more facts today.



Concentricity of valve seat and stem hole held to .0005" total indicator reading.

TO SAVE TIME INVESTIGATE BARNES' 6-POINT MACHINE TOOL BUILDING SERVICE

For over 75 years, Barnes has designed and built special machinery. These years of experience can assist you in saving time and cutting costs. Check the advantages of an engineering and building service from one convenient source.

1 **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to build high production machines.

2 **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

3 **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.

4 **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operations at high production speeds.

5 **SPECIAL HANDLING AND CONVEYOR EQUIPMENT**—designed and built to reduce work handling, effect maximum safety and efficiency.

6 **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

WRITE FOR FREE BOOKLET



Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service.

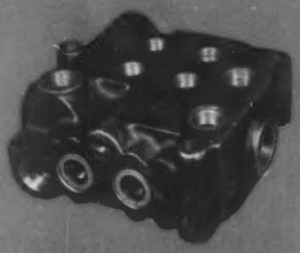
W. F. & JOHN BARNES COMPANY
310 SOUTH WATER STREET, ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**



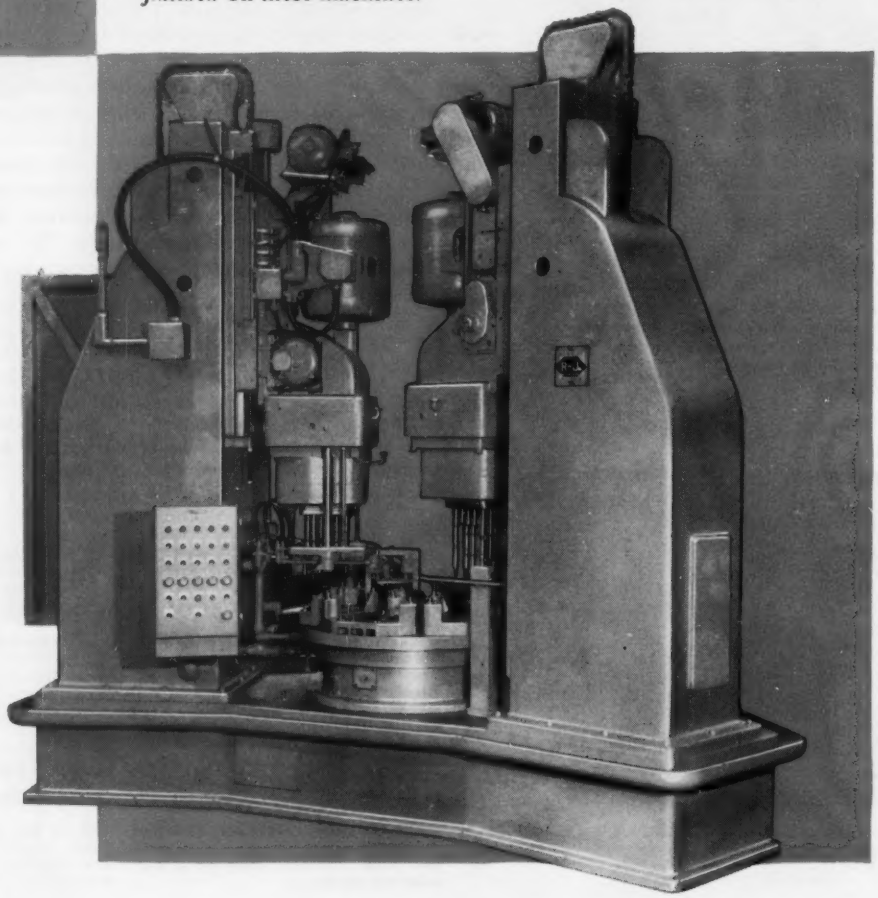
Rehnberg-Jacobson



A sample Hydraulic Control Valve Body. This one is the ¾" size, 2-cylinder model, weighing about 30 pounds, and requiring the machining of 15 holes.

PRODUCTION MACHINING IN JOB-SIZE LOTS...

Unlike most special-purpose machines, those made for this job were designed for short runs instead of mass production. Actually, it is a case of some mass-production techniques being applied to job-size lots of from 200 to 1500 pieces. The machines handle four different sizes of Control Valve Bodies for a hydraulic lift system, with four variations (one, two, three, and four-cylinder models) of each size. In a preceding step, pads are milled and three locating holes drilled and reamed — after that, each piece is *completely finished* on these machines.



ONE MACHINE OF A SERIES OF THREE

The parts have holes in all six faces, and are drilled, reamed, and tapped as variously required, including finishing of valve piston holes, on a series of three machines, all of which are quite similar to this one. Interchangeable heads, removable tools, and variable-speed spindles provide versatility. Drive to all drilling and tapping heads is provided by Rehnberg-Jacobson ALL-MECHANICAL Screw Feed Power Units.

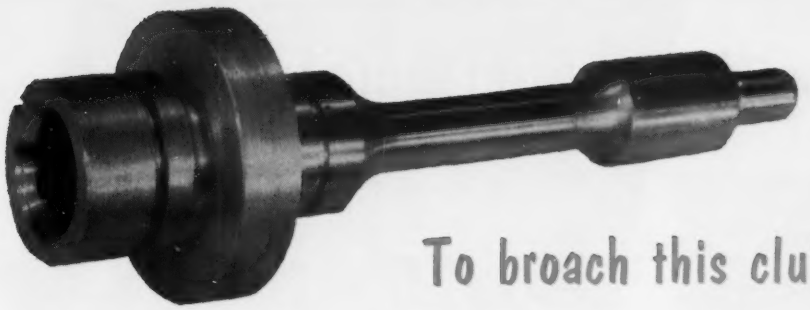
REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

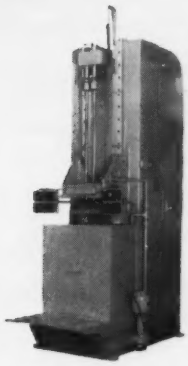
R-J

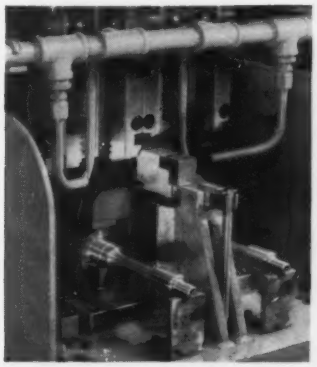
2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



To broach this clutch gear...





use this *American* machine... in this fashion...



...to get this result!

Approximately 300 clutch gears per hour can be broached on this American 3-Way Type Vertical Hydraulic Broaching Machine. A two station fixture is provided to locate parts in V-shape locators. Air clamping locks the parts into place. At the end of the broaching stroke the parts are automatically unclamped and the operator unloads them while returning the machine ram to starting position.

Flats approximately 5/16" wide are broached on the diameter of the large end of the gear.

This broaching operation is a standard operation on a standard American machine. If your problem is more difficult, American has the experience and skill to devise a special machine, fixture or broach for your purposes. Send a part-print or sample for a recommendation leading to a solution of your broaching problem. Or send for catalog #300 which illustrates and describes standard American machines.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

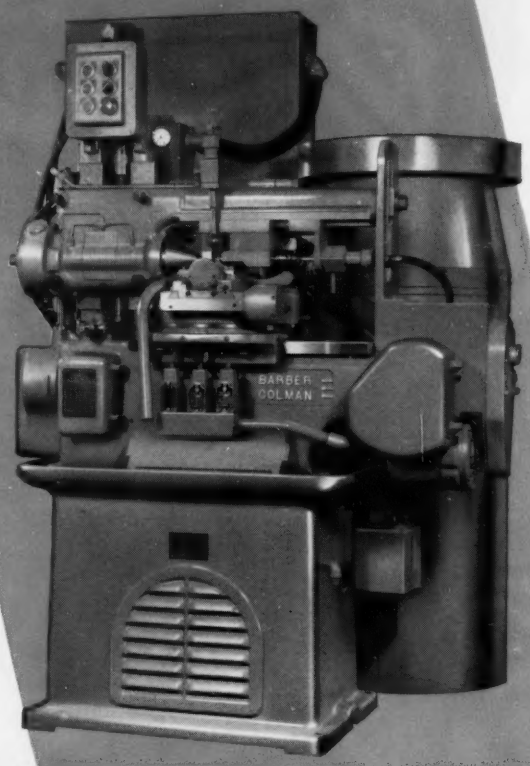


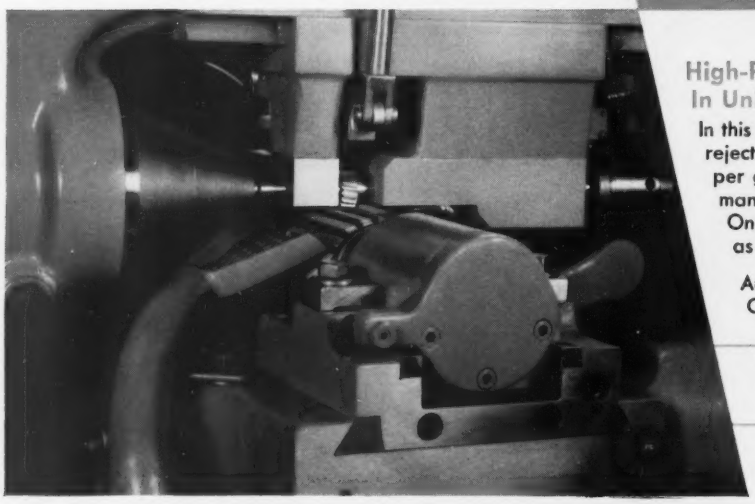
FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

Fully Automatic GEAR HOBBING

offers
new low costs
on gears
16 pitch or finer

As more and more gear operations are modernized to place them on a competitive basis, automatic gear hobbing equipment becomes an essential approach in reducing gear costs. Since 1937 Barber-Colman engineers have been working closely with major gear producers in the application of automatic gear hobbing. At first, automatic hobbing applications were made in the watch gear and instrument fields. Later, machines were built for medium pitches in other fields, such as fishing reel gears. Now this latest Automatic No. 6-10 Hobbing Machine is designed specially for cutting automatic transmission and speedometer gears to meet the required rate of production on an automatic production line.





High-Production Plant Reports Savings In Unit-Costs with Fewer Gear Rejects

In this particular production plant, fewer gear rejects are occurring. An overall reduction in cost per gear has been effected through reduced man-hours and continuous high-speed output. One of a battery of machines performs as follows:

Automatic Cycle —	356 Hob RPM, 175 Hob SFM. .050" feed per rev., 60-second complete cycle time.
Transmission Gear —	16 teeth, 18° 30′ helix angle 18 DP., SAE 1330, .937" OD. x ⅝".
Class C Accurate Unground Hob	1⅞" dia. x 3" face x ¾" bore, 3 threads, unground, pre-shave.

Completely Automatic Cycle Provides Continuous High-Speed Gear Cutting

Blanks are automatically loaded through a hopper-feed system and positively located and clamped hydraulically on a solid arbor in cutting position. The cycle sequence includes rapid traverse to the hobbing position, lowering of the work slide to cutting depth, hobbing the blank, raising the work slide, rapid traverse to the right, and unload. A new blank then is automatically presented for hobbing and the cycle repeated continuously until the machine is shut off.

Machine features include automatic hob shifting for greater tool life and metered hydraulic pressure for positive arbor mounting and ejection. Rapid traverse is actuated electrically, and the work slide is hydraulically actuated

B U I L D E R S O F P R E C I S I O N G E A R

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

Adaptable to Wide Range of Long-Run, High Speed Gear Production.

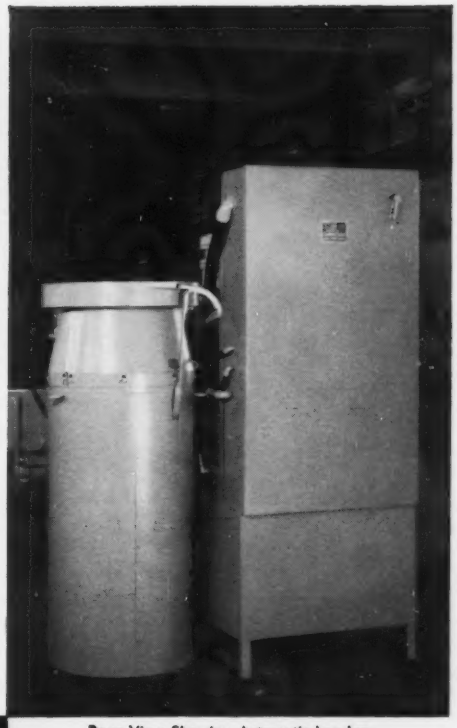
This type of cycle arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending upon the particular gear specifications. The cycle is arranged to suit the requirements of the job, and tooling, feed, speed and cycle-timing will depend upon the required production and gear specifications.

Positive Control Over Gear Accuracy Through Automatic Arbor Loading.

Barber-Colman automatic hobbing supplies positive gear accuracy control through specially developed tooling which mechanically mounts blanks solidly upon the work arbor prior to cutting. This arrangement eliminates chances for looseness, runout or vibration likely to occur in other types of mounting. Work arbors are designed for positive pick-up and location of the blank.

Cycle Fully Protected by Automatic Stops.

A combination of electric limit switches, program motor and mechanical movements governs the cycle. Faulty blanks are automatically rejected if presented for hobbing, and the machine is under complete control at all times.

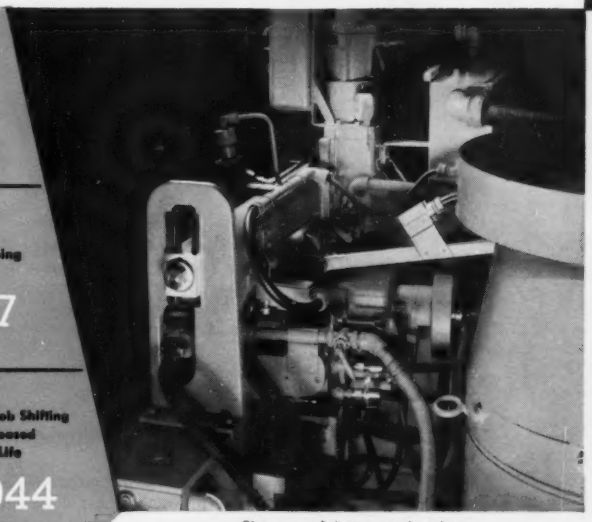


Rear View Showing Automatic Loader and Electrical Panel

First Automatic Cycle Hobbing Machine
1936

First Fully Automatic Hobbing Machine
1937

Automatic Hob Shifting for Increased Tool Life
1944



Close-up of Automatic Loading

Engineering Service Available Without Obligation

Check your high production gear operations to determine whether you are maintaining a competitive cost basis. Barber-Colman engineers will gladly consult with your gear production people to demonstrate the cost-saving benefits of automatic hobbing. Ask your Barber-Colman representative to arrange an appointment for you, or write directly to Automatic Hobbing Engineering. No obligation!

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

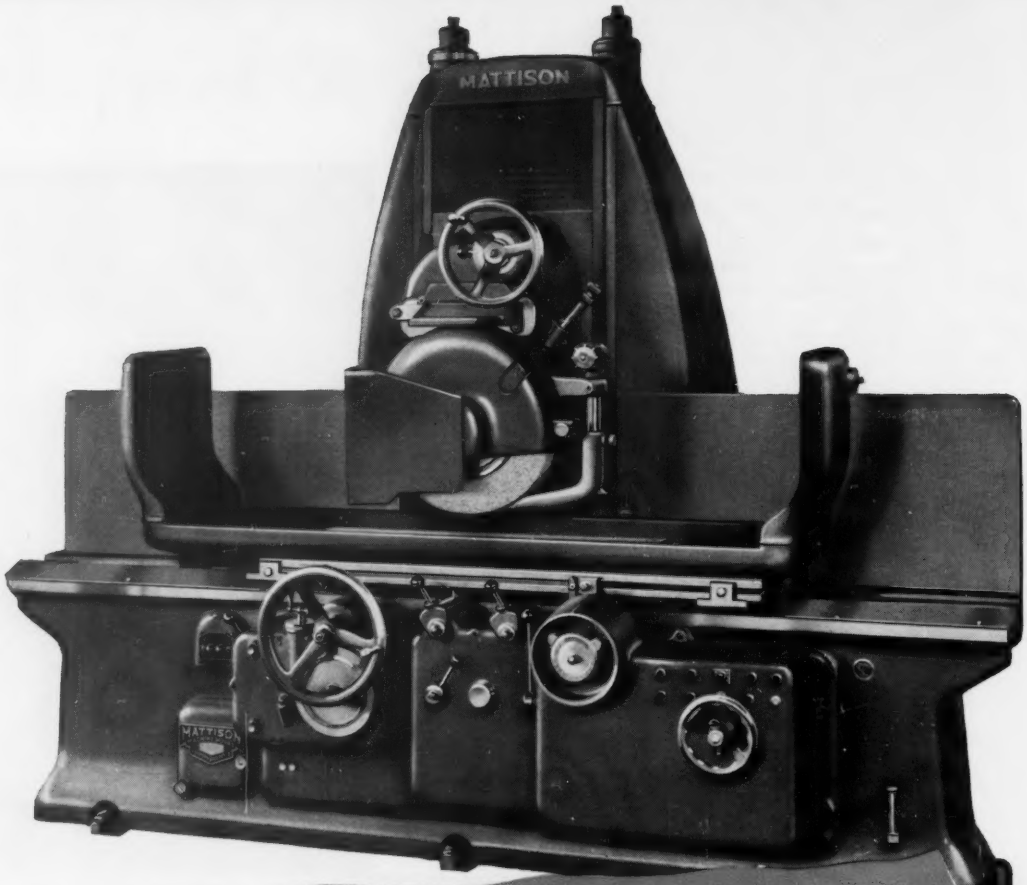
BARBER COLMAN

Barber-Colman Company

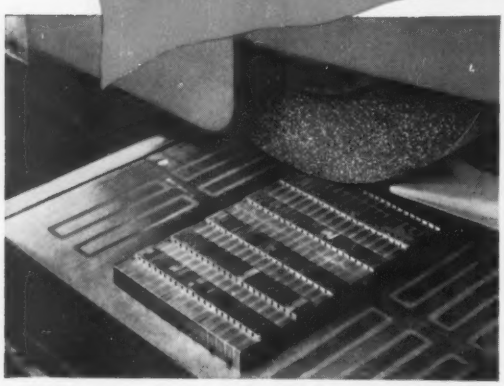
GENERAL OFFICES AND PLANT, 6210 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**



HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR



Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production—30 per hour.

● Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example — the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder — 30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

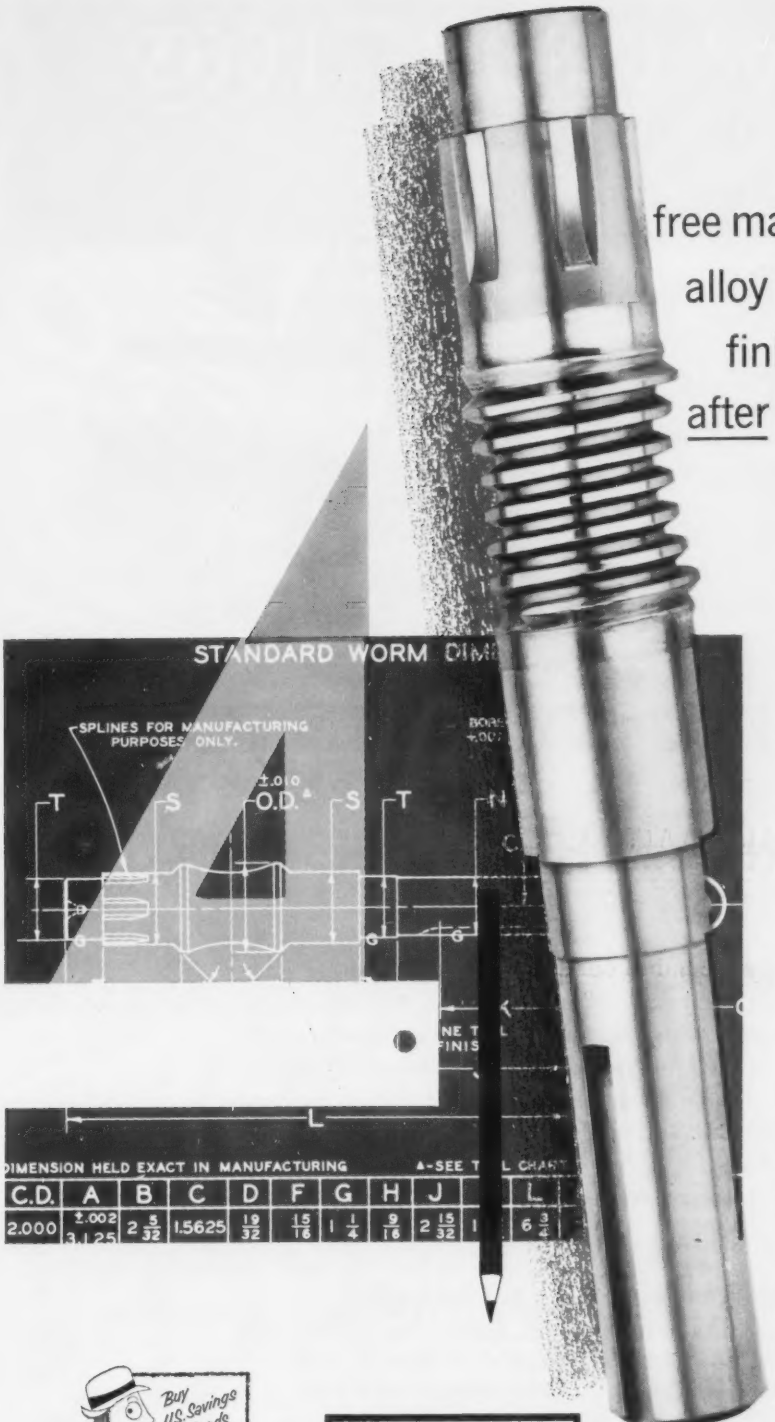
MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

free machining **MAX-EL** alloy steel worm finish machined after full heat treatment...



This double enveloping worm of Crucible MAX-EL® 3½ alloy steel, made by Cone Drive Gears, Division of Michigan Tool Company, was completely machined *after full heat treatment.*

As our customer writes: "This requires an extremely free-cutting material in order to secure desired accuracy, and we have used MAX-EL quite successfully, due to its free machinability in the heat-treated state (Rockwell C 35-38)."

But try MAX-EL for yourself. You'll find that its free machining qualities, freedom from distortion, deep hardening characteristics, and the longer tool life you will get from its use, will help your production line run smoother. For further information, and *fast* delivery of MAX-EL – *call Crucible.*



CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • . . .ON DENVER • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH PROVIDENCE • ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • ST. PAUL • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

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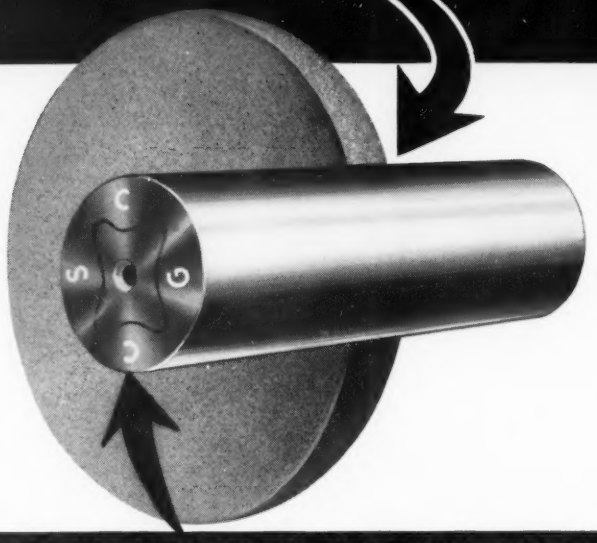
An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,

smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

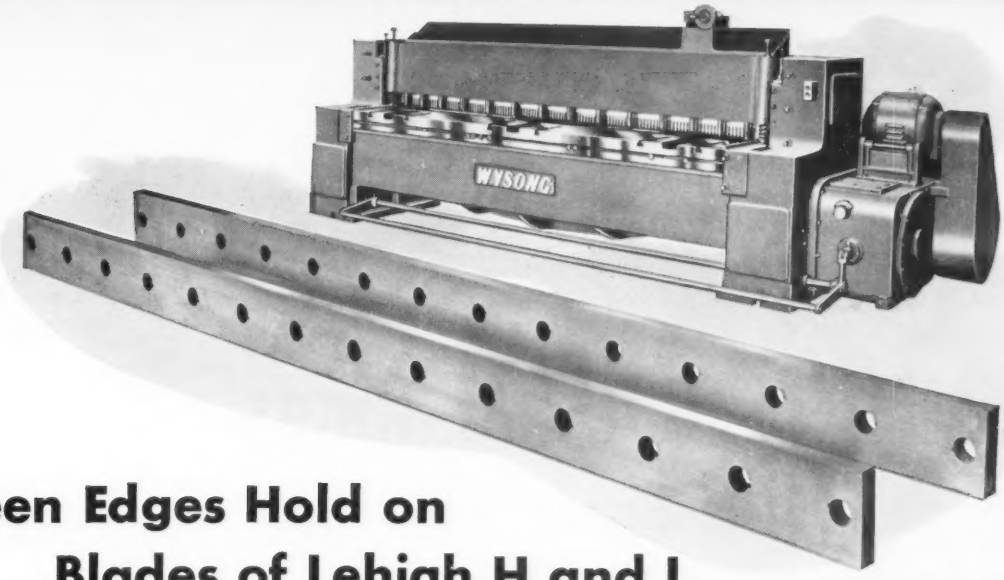
ESTABLISHED 1845 **INCORPORATED 1892**

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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast, Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Keen Edges Hold on Blades of Lehigh H and L

The shear blades shown here are representative of the blades used in pairs in power squaring shears manufactured by Wysong & Miles Company, Greensboro, N. C. The blades are hollow ground, and are made of either Bethlehem Lehigh H or Lehigh L tool steel. They perform economically at speeds up to 60 strokes per minute because they hold their cutting edges for long periods of time, in this way minimizing the need for frequent regrinding.

Lehigh H and Lehigh L are high-carbon, high-chromium tool steels. They form high-chromium carbide concentrations, meaning the ultimate in wear. With its lower carbon content and addition of 1.00 pct nickel, Lehigh L has unusual toughness. It is used for shearing thicker material where shock is involved.

TYPICAL ANALYSES

	C	Cr	Mo	V	Ni
Lehigh H	1.55	11.50	0.80	0.40	—
Lehigh L	0.85	11.50	0.45	0.30	1.00

You can count on good wear-resistance with Lehigh H or Lehigh L. If you would like to have more information about these steels and their use, we suggest that you contact your tool steel distributor, or write direct to us at Bethlehem, Pa.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

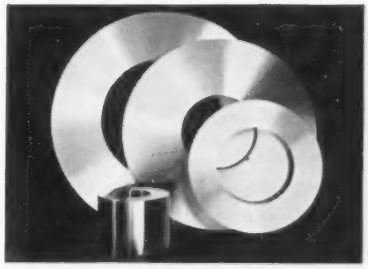
First Harden the Die, Then the Punch

In making up special punch-and-die sets, the fitting of the punch and die after hardening often involves hand grinding or stoning to remove the size changes produced during the hardening operation. The hole in the die will often close in, while the punch will usually expand in diameter. Thus the two parts will not fit, or will lose clearance.

In order to minimize such difficulties, and to reduce tool costs, the use of the following procedure is recommended:

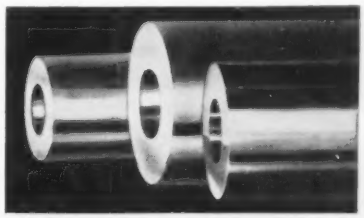
1. Make up the die, and harden it. 2. Make up the soft punch, and fit it to the die. 3. Harden punch. 4. If necessary, fit punch to die by grinding.

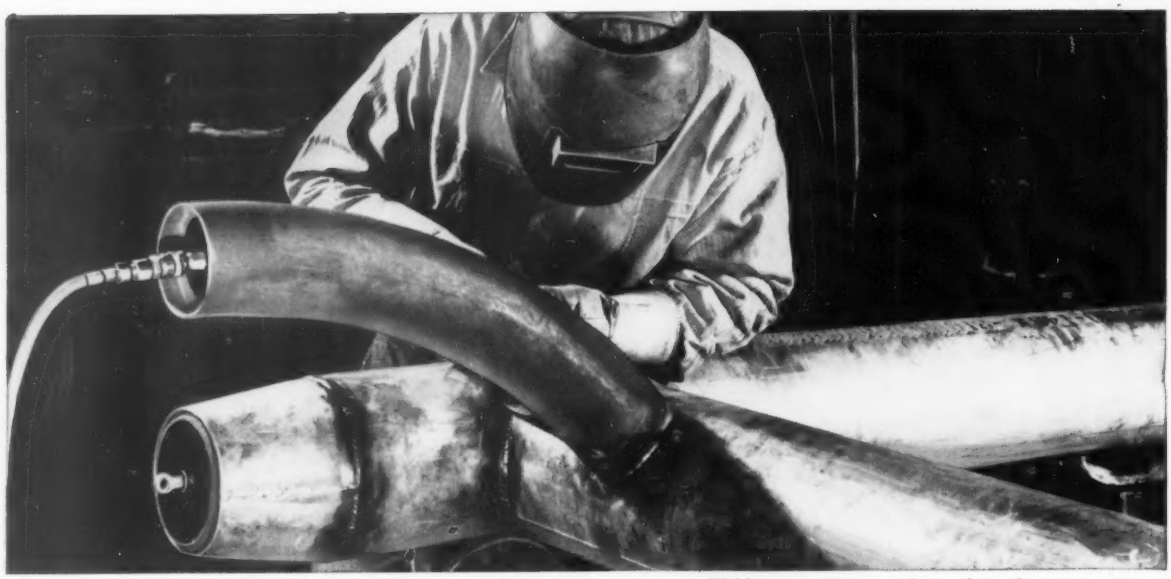
In this way, only one of the two parts is ground in the hardened condition, and the grinding is external and easier than internal grinding. To avoid excessive grinding, it may occasionally be advisable to allow for size-change in the die. But in the main this procedure can bring worthwhile economies.



HOLLOW-BAR TOOL STEEL IS IDEAL FOR RING-TYPE APPLICATIONS

BTR (Bethlehem Tool Room) Hollow-Bar is an excellent steel for hardened bushings, ring dies, draw rings and similar uses *(above)*. It is produced by high-speed trepanning, in which hammer-forged or hot-rolled round bars *(below)* are cored out, followed by rough turning on the outside. Hollow-Bar saves production time, for there's no need to wait for forged rings or discs. Quick delivery, too, for rings can be cut to any length.





Argon gas being used as a backing agent replacing backing rings . . . Welding operations are fast and simple.

ELIMINATE Backing Rings

in Stainless Steel Piping with HELIARC Welding

Trade-Mark

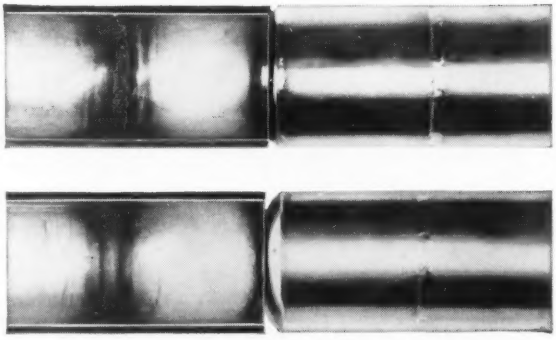
The combination of stainless steel pipe and HELIARC welding with argon gas backing produces a corrosion-resistant piping system—ideal for handling foods, fluid metals, corrosive liquids, high-pressure and high-temperature steam, and pharmaceutical products.

No backing rings—argon replaces the atmosphere in the section of pipe to be welded, and protects the weld bead from the underside as it is formed. This eliminates the need for metal backing rings.

New torch techniques allow the operator to control the size and shape of the penetration bead inside the pipe, while he is making the weld.

Smooth, sound joints—every time. HELIARC welding produces joints free from obstructions, notches, and crevices which hinder or trap flowing materials within the piping system. The penetration bead in the pipe is held within 1/32-in. of the pipe's normal inside diameter.

For the full story on argon-backed, stainless steel pipe fabrication, ask your local LINDE representative for the booklet, "Inert-Tungsten Arc Welding of Stainless Steel Piping," F-8463. In addition, he will be glad to give you complete information on how HELIARC welding cuts time and cost in many other applications. Start saving now—call him today.



Top—interior and exterior of completed welds without argon backing. Bottom—with argon backing, note the smooth, porosity-free, high quality welds.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY

Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

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one is always best

...and REX is the standard by which all high speed steels are compared

No matter how keen the competition, there can be only one winner. And the difference between the winner and the runner-up, whether it's golf or making high speed steels, is measured in performance.

Crucible REX® high speed steels have proved their championship qualities under the toughest sort of competition — in actual use in thousands of tool shops throughout the world. But check for yourself. Try a piece of REX high speed steel on your next job. Compare its hardenability, response to heat treatment, its fine tool performance. You won't find another high speed steel to outperform REX.

Ask for REX by name wherever high speed steels are sold. But remember, REX is made *only* by Crucible.



CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

TRIED and TESTED—
AVAILABLE NOW!

New EZ machining LUDLUM TOOL STEELS

DBL2-EZ
VLM-EZ
LMW-EZ
HIGH SPEED STEELS

HURON-EZ
ONTARIO-EZ
DIE STEELS

"EZ" is a well-known symbol to users of Allegheny Ludlum products. We've been producing easy-machining stainless steel grades under that symbol for many years . . . they're a standard in the industry for improved machining characteristics.

This long experience, applied to the "EZ"-machining grades of the three High Speed and two Die Steels listed above, is your assurance of dependably uniform free-cutting qualities and improved finish—wherever such properties are desirable in your operations.

All five grades have been thoroughly proved and are readily available in the usual wide range of shapes and sizes. ● Write for literature on the grade(s) in which you are interested. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pennsylvania.*

ADDRESS DEPT. M-58

For complete MODERN Tooling, call
Allegheny Ludlum
WAD 5222

AL® FINE TOOL STEELS SINCE 1854

For more information on products advertised, use Inquiry Card, page 243

Only GRAPH-MO® gives you all three advantages in one tool steel

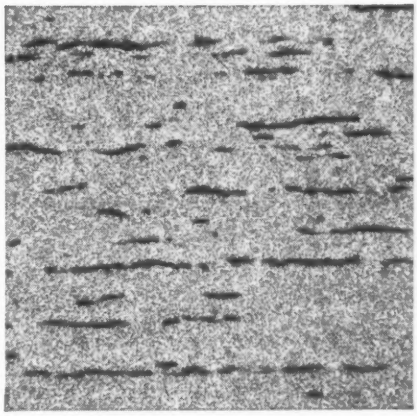
Wearability—*Outwears other tool steels 3 to 1*

Stability—*Is the most stable gage steel ever made*

Machinability—*Cuts machining time 30%*

YOU can make gages and dies that stay accurate longer and produce them in less time by using Graph-Mo® graphitic tool steel. That's because only Graph-Mo gives you the combination of wearability, stability and machinability that you want in a tool steel.

Free graphite and diamond-hard carbides in the structure of Graph-Mo steel give gages and dies extraordinary life. Reports from users show that Graph-Mo outwears other tool steels 3 to 1.



100X

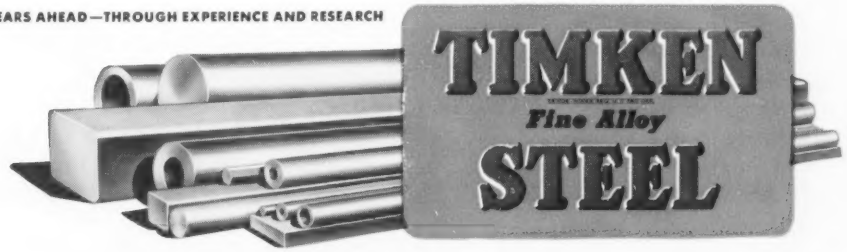
In your plant, Graph-Mo steel will cut production time and rejects. Because of its graphitic structure, Graph-Mo steel machines 30% faster than other tool steels. This structure also gives excellent resistance to abrasion, and has minimum tendency to pick up, scuff or gall. Tests on Amsler Wear Machine show Graph-Mo has twice the resistance to galling when compared with ordinary tool steels.

The greater stability of Graph-Mo steel enables you to make gages that stay accurate longer. After 12 years of service, for example, a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original dimensions.

You can always tell Graph-Mo steel by its "graphitic look"—the tiny, scattered, parallel marks barely visible on the surface of a piece of polished Graph-Mo. This built-in "trade-mark", the result of free graphite in its structure, can't be duplicated in ordinary steels. The photomicrograph at left shows the free graphite and diamond-hard carbides that give Graph-Mo unusual wear resistance.

Write today for more information on Graph-Mo steel. The Timken Roller Bearing Company, Steel and Tube Div., Canton 6, Ohio. Cable address: "TIMROLCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Big Forgings



Double-flanged shafts for use in hydroelectric installations. The one at the right weighs 67 tons; the one alongside it, 52 tons. Both were smooth-bored with 12-in.-diam axial holes.

. . . and some that aren't so big



Tie rods weighing 2¼ tons each. Length, 16 ft 10 in. The diameters of the flanges and main bodies are 16½ in. and 10 in. respectively.

. . . and some that are flyweights



One of the little fellows of the Bethlehem family—a drop forging that grosses less than 2 lb. Some we make are even smaller.

The Bethlehem forge shops are so highly diversified that a customer can get just about any forged product he wants.

We're always glad to furnish him massive giants weighing sixty, eighty, a hundred tons. Or considerably more than a hundred, if his needs run that high.

But if he requires some medium-sized pieces, or something very small, he'll find us equally well set up to do the job. And whenever he wants his forgings machined . . . all he has to do is give us the specifications.

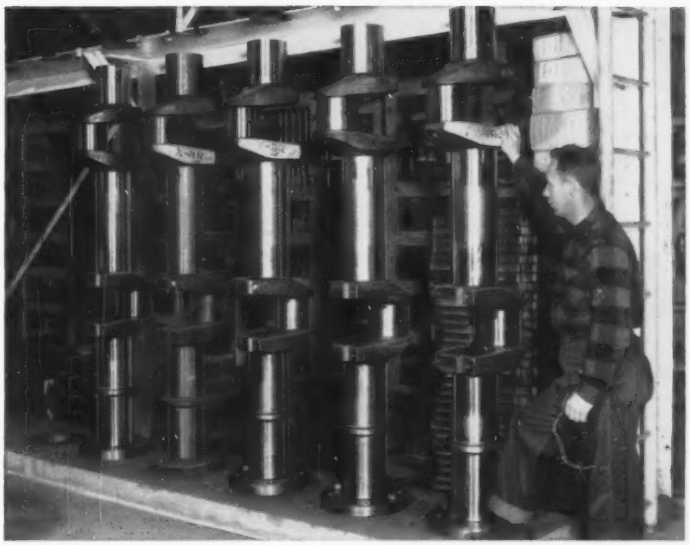
May we say it again? Bethlehem Steel Company makes *all* sizes of forgings. And pleasing the customer is a specialty of the house!

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Ductile Iron Crankshafts cast at The Cooper-Bessemer Corporation's Mount Vernon, Ohio, foundry and machined at its plant in Grove City, Pa., for GMX-4 engines. The first of this model equipped with a ductile iron shaft was shipped in June, 1953. Cooper-Bessemer initiated development work on high test irons for crankshafts in 1935. Some mechanical properties of ductile iron, compared with those of forged steel . . . traditionally used for crankshafts . . . are shown below.



HIGH

Mechanical Properties, Wear Resistance and Castability make

Comparative Properties		
	Ductile Iron	**Forged Steel**
Tensile Strength	79,200 psi	80,100 psi.
Endurance Limit (Smooth bar)	31,500 "	35,000 "
Endurance Limit (Notched bar)	20,750 "	17,800 "
Modulus of Elasticity	22,600,000	29,000,000
Brinell Hardness	220	170

Ductile Iron an Ideal Crankshaft Material

Wouldn't you rather *cast* a crankshaft than block forge it?

Wouldn't your costs tumble for every unit with bearings cored out, counter-weights molded on, and the entire piece cast within tolerances that reduce machining to a minimum?

And wouldn't the excellent castability, toughness, stiffness and machinability of ductile iron bring you advantages like those brought to Cooper-Bessemer?

Glance at the tabulation. You'll see a few reasons why Cooper-Bessemer concluded that ductile iron provides the best combination of properties offered by any material they have tested for crankshafts.

The damping capacity of ductile iron is excellent . . . less than that of gray iron, but far superior to steel. Especially valuable in crankshafts is the relatively high "notched endurance limit" of ductile iron. And another outstanding property is its resistance to mechanical wear . . . under lubricated or non-lubricated conditions.

Combining the *process advantages* of cast iron and the *product advantages* of cast steel, ductile iron has, actually, many applications.

Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing ductile iron under patent licenses. Request a list of available publications on ductile iron . . . mail the coupon now.

EMBLEM OF INCO SERVICE

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

Please send me a list of publications on: DUCTILE IRON.

Name _____ Title _____

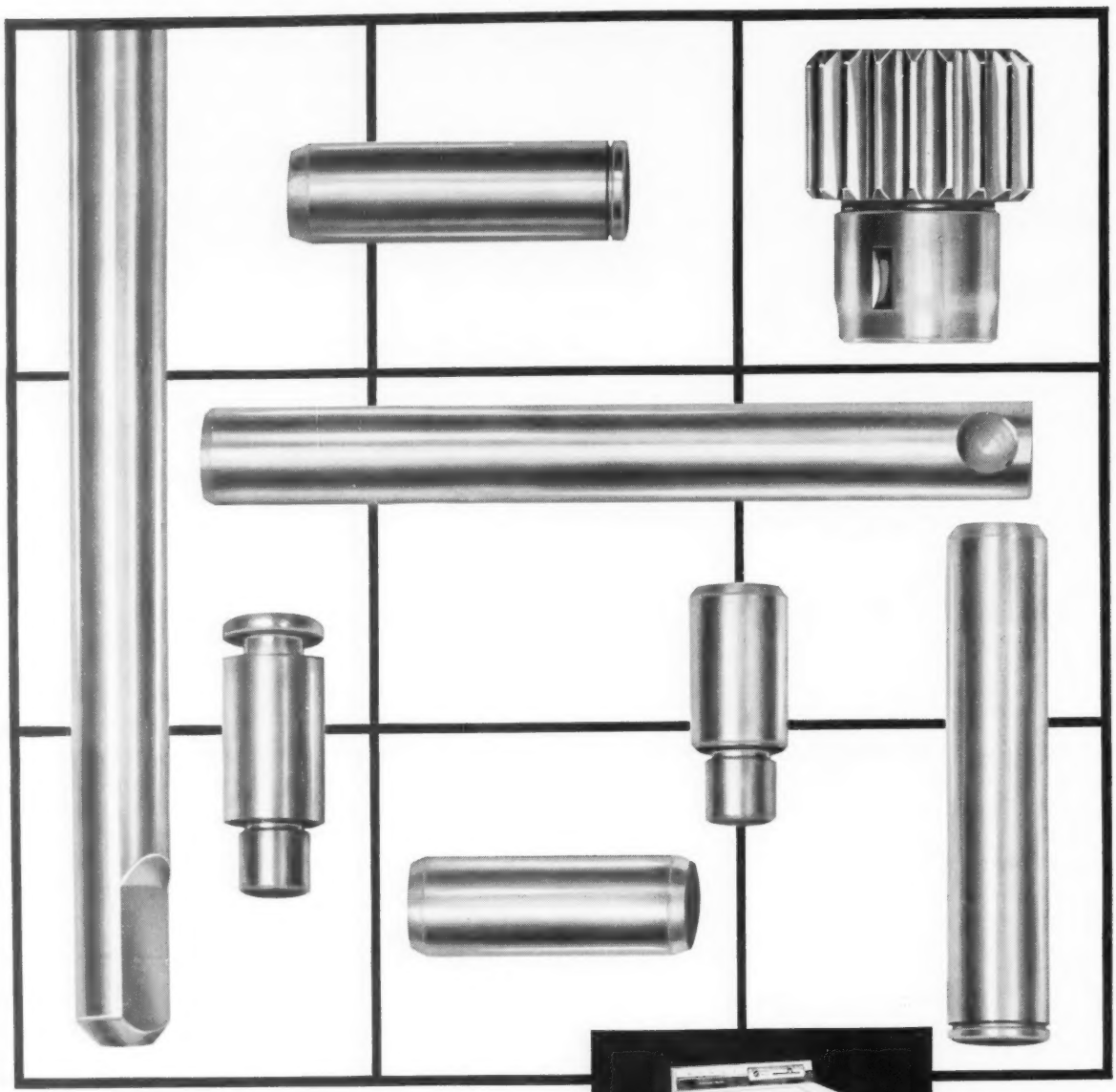
Company _____

Address _____

City _____ State _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

How Norge



The parts above are made from Republic Cold Drawn Carbon Corrected Bars. They are used in the top-rated Norge Automatic Washer, Model AW450, manufactured by the Norge Division of Borg-Warner Corporation.



reduced costs 16%

with

REPUBLIC COLD DRAWN CARBON CORRECTED BARS

These parts go into the new Norge Automatic Washer, Model AW 450. They were being made from C-1117 Cold Drawn Steel. Production on the parts was good. But, they had to be trucked to a nearby city for carburizing. This increased unit cost.

Republic Metallurgical Service was asked for advice on how to cut unit cost and still maintain production. After careful consideration of all factors, a switch to Republic Cold Drawn Carbon Corrected Steel was recommended.

Machining and tooling alterations were worked out through close cooperation between Norge Engineers and a Republic Machining Specialist.

Here are the benefits Norge is receiving as a direct result of switching to Republic Cold Drawn Carbon Corrected Bars:

1. The costly carburizing operation has been eliminated.
2. They are getting better machinability.
3. The quality of the parts has been improved.
4. Unit costs have been reduced 16%.

WHAT IS CARBON CORRECTION AND HOW CAN IT HELP YOU?

Carbon correction is the restoration of carbon lost from the bar surface during hot rolling. This lost carbon is restored right out to the edge of the bar through annealing in a controlled carbon-rich atmosphere prior to cold drawing.

Carbon Corrected Bars are ideally suited for your steel parts which must have high surface hardness —particularly those produced by both high and low frequency induction heating.

Using Republic Cold Drawn Carbon Corrected Bars eliminates waste, both in metal and money. It's not necessary to machine or grind away the surface to remove "decarb". You eliminate buying bars oversize to allow for surface removal. You get better MACHINABILITY.

Our metallurgists and machining specialists are ready to help you use Republic Cold Drawn Carbon Corrected Bars to the best advantage.

Call your nearby Republic District Sales Office.

REPUBLIC STEEL CORPORATION

Union Drawn Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, New York

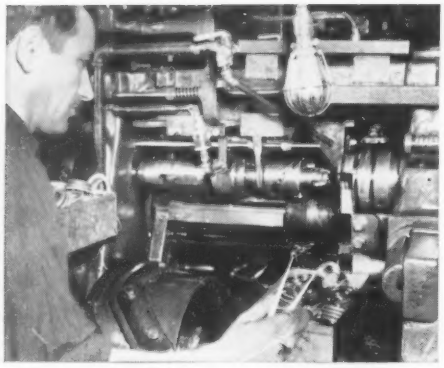
REPUBLIC *Union* COLD DRAWN STEELS

REPUBLIC STEEL

Free-Machining Bessemer, Alloy and Enduro Stainless Steels • Union Cold Drawn Special Sections • Union Cold Drawn and Ground Rounds, Turned and Polished Rounds, and Turned, Ground and Polished Rounds

For more information on products advertised, use Inquiry Card, page 243

FREE-MACHINING ENDURO STAINLESS STEEL BARS



Put parts in the pan 90% as fast as Bessemer screw stock

You can give duplicate parts the high physical and chemical properties of stainless steel. And, you can do it without a heavy production penalty!

Simply set up and run Free-Machining ENDURO Stainless Steel Bars. They'll respond beautifully at every station on your automatics. Two grades are fully 90% as machinable as Bessemer screw stock.

These high-quality bars are cold-finished by Republic's Union Drawn Steel Division. They provide close tolerance, accuracy of section, uniform soundness, and fine surface finish.

Free-Machining ENDURO also is available in hot-rolled bars and in wire. Republic metallurgists and machining advisers are ready to help you apply ENDURO every step of the way. Just write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • *Massillon, Ohio*
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

NEW! 96-page pocket size booklet, "How To Machine Republic ENDURO Stainless Steel Bars." Packed with machining tips, tables of feeds and speeds, stainless steel properties, other vital information. Write Republic. Ask for ADV-607. FREE!

REPUBLIC ENDURO FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Bars, Wire, Pig Iron, Steel and Plastic Pipe, Bolts and Nuts, Tubing

For more information on products advertised, use Inquiry Card, page 243

Vanadium-Alloys Steel Company

matchless performance

in Die Steels for Cold Work

because of

better toughness

better grain size control

better control of segregation

and

manufacture by specialists in first quality tool steels

exclusively!

Non-Shrinkable Colonial No. 6

The non-deforming, oil-hardening steel that combines ease of machining with low hardening temperature. Fine performance on blanking dies, punches, gauges, bushings, etc.

Air Hard

5% chromium, air hardening with minimum distortion. Provides toughness and better wear resistance for thread rolling dies, forming and blanking dies, knurls, punches, gauges.

Ohio Die

High carbon, high chromium alloy, air hardening. Affords exceptional resistance to wear, with long life on trimming die, lamination die, shear blade, coining die, roll, mandrel and other difficult assignments.

Crocar

Air or oil hardening. A high carbon, high chromium steel, highly wear resistant; properly selected for lamination dies, wear plates, slitting cutters, forming dies.

Red Star Tungsten

Oil hardening. Unusual edge strength and wear resistance, with high hardness. Specify for taps, punches, spinning tools, slitters, blanking dies.

VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

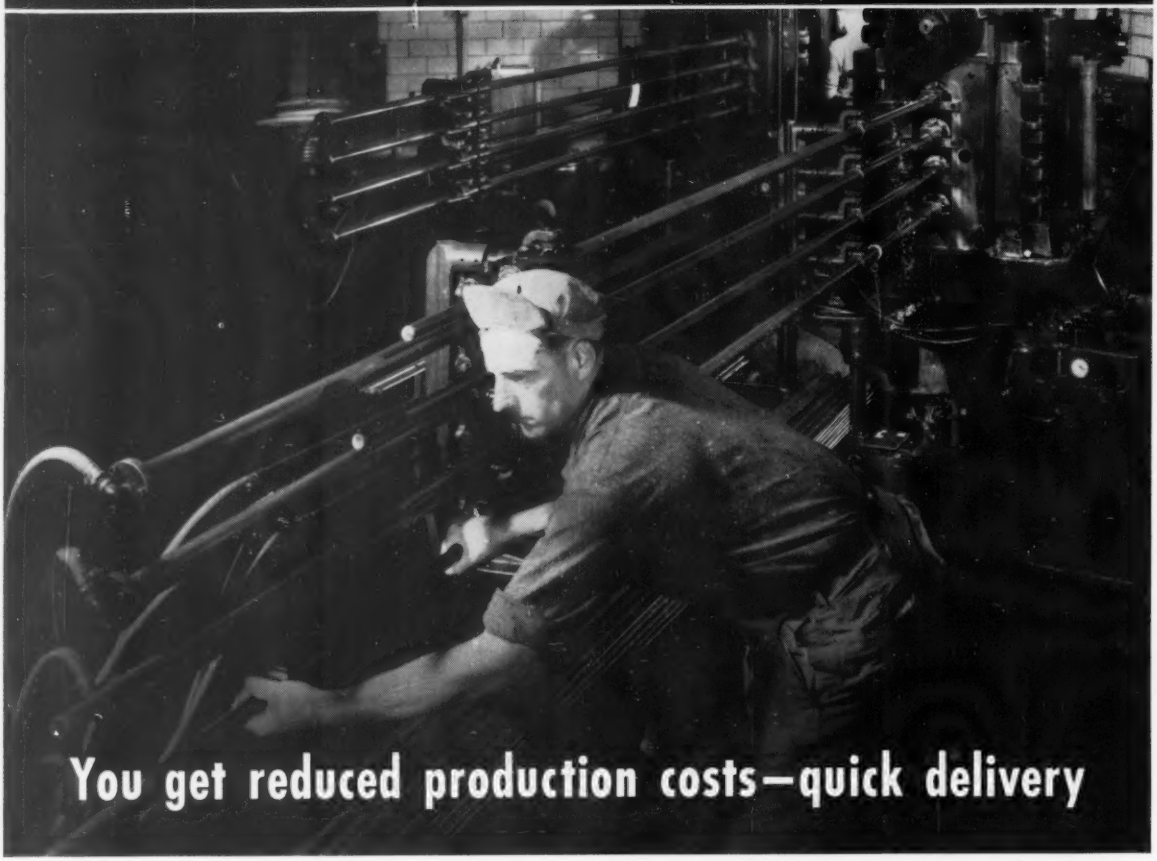
Latrobe, Pennsylvania

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

In Canada:

Vanadium-Alloys Steel Canada Limited, London, Ontario

WHY IT PAYS TO BUY MX SCREW STOCK FROM US



You get reduced production costs—quick delivery

● Hundreds of shop cases have shown that USS "MX" free-machining bar stock cuts unit costs considerably . . . an average of 10% to 15%, sometimes as high as 42%. And the more machine work your parts require, the greater the savings.

Here's how you cut costs when you use "MX" rather than other free-machining grades:

You get more parts per hour, longer tool life with less down time for grinding and adjustment, fewer rejects, closer tolerances and better part finish.

One of our qualified sales representatives will gladly discuss the advantages of "MX" with you as they apply to your particular shop requirements. And you can always depend upon quick delivery from the nearest U.S. Steel Supply warehouse.

In addition to "MX" stock, we carry: cold finished rounds, squares, hexagons. flats and precision shafting in all grades.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY

DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

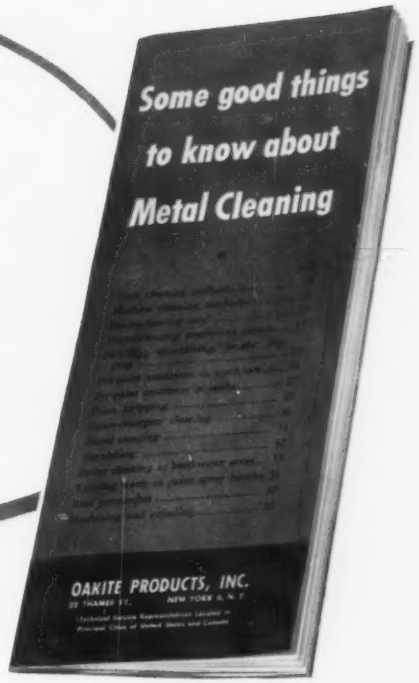
Warehouses and Sales Offices
Coast to Coast

USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

For more information on products advertised, use Inquiry Card, page 243

WHICH OF YOUR METAL-CLEANING JOBS WOULD YOU LIKE TO IMPROVE?



¶ Are you cleaning metal in the most economical way? *See page 9 of Oakite's* FREE *booklet on Metal Cleaning.*

¶ Are you cleaning metal the fastest way? *See page 11.*

¶ Can you clean brass anodically with no tarnish? *See page 18.*

¶ Can you clean steel and prepare it for painting for less than 20 cents per 1,000 square feet? *See page 24.*

¶ Do you need a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page 28.*

¶ How do you clean parts that are too large to be soaked in tanks or sprayed in machines? *See page 30.*

¶ Does your burnishing barrel produce high luster? *See page 32.*

¶ What do you do when oversprayed paint neither floats nor sinks in your paint spray booth wash water? *See page 35.*

¶ Would you like to eliminate expensive drying from your anti-rust procedure? *See page 37.*

LISTED BELOW are some of the operations discussed in this 44-page illustrated booklet. Please check the jobs in which you are interested. Then let us show you how Oakite methods can give you better production with greater economy.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC., 26 Rector Street, New York 6, N. Y.

Tell me about Oakite methods and materials for the following jobs:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning steel
- ☐ Electrocleaning non-ferrous metals
- ☐ Pickling, deoxidizing, bright dipping
- ☐ Pre-paint treatment
- ☐ Zinc phosphate coating
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ Treating water in paint spray booths
- ☐ Machining and grinding

☐ ALSO send me a FREE copy of your booklet "*Some good things to know about Metal Cleaning*"

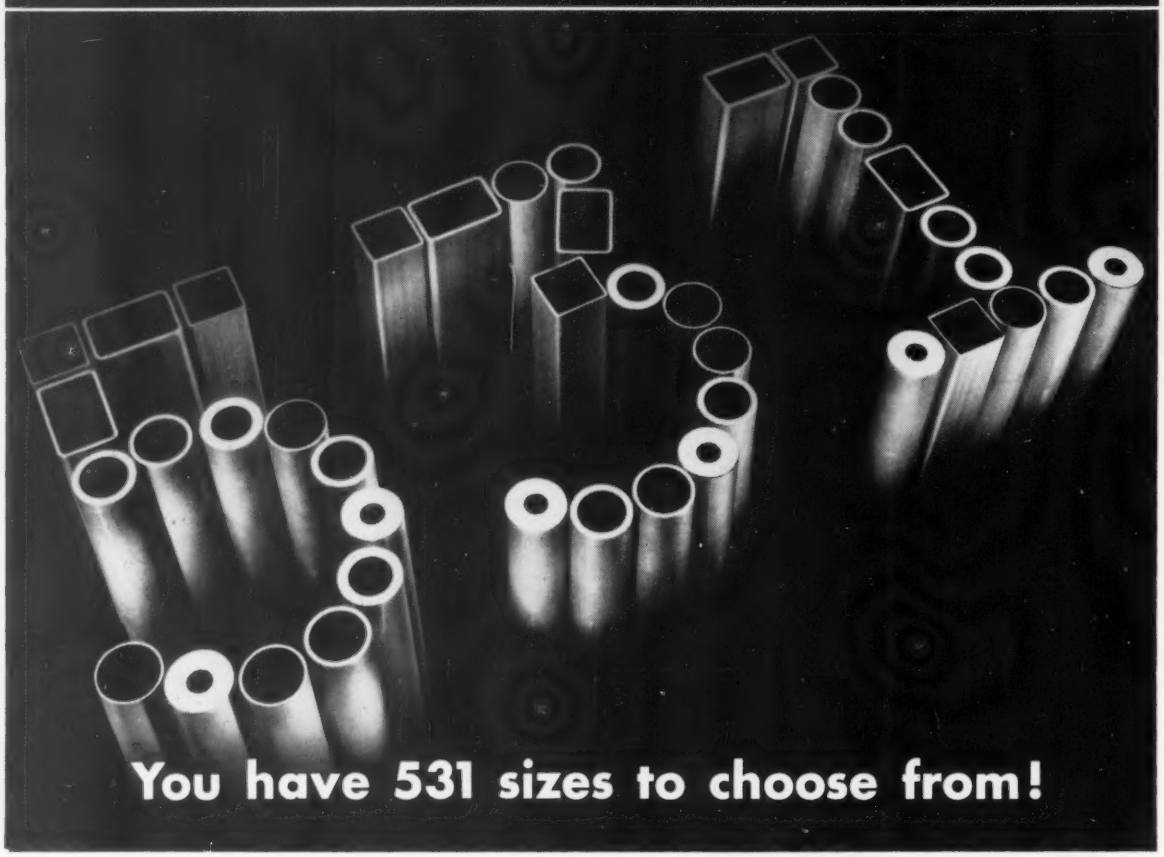
*Name*_____

*Company*_____

*Address*_____

Technical Service Representatives in Principal Cities of U. S. and Canada

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US



WE carry no less than 531 sizes of Shelby Seamless Mechanical Tubing and can fill orders promptly . . . by the inch or by the carload. No matter what your tubing needs, we can supply you with the best for the job – tubing manufactured by the world's leading producer, National Tube Division of United States Steel.

Our experience in the field of tubing applications has often saved large sums of customers' money—for it is sometimes possible to substitute a more economical type of tubing than you had planned to use.

We carry everything you need. Call us for: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; stainless steel tubing, seamless and welded, and stainless pipe.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY
DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

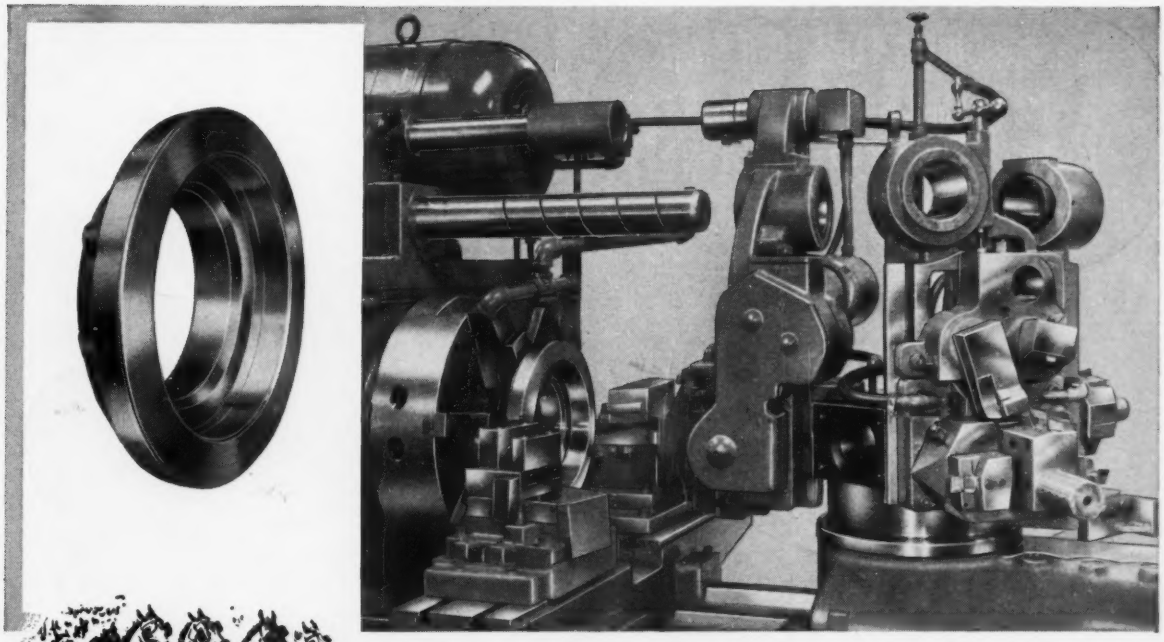
USS

Warehouses and Sales Offices
Coast to Coast

USS TRADE MARKS SHELBY MECHANICAL TUBING UNITED STATES STEEL

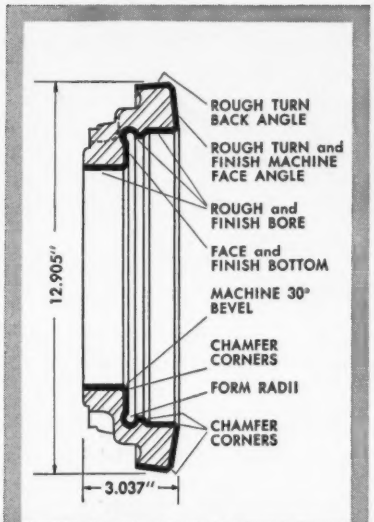
UNITED STATES STEEL

For more information on products advertised, use Inquiry Card, page 243





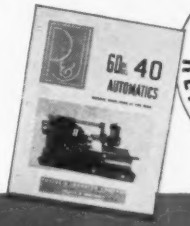
FORTY HORSES "pulled the team" that made this bevel gear blank



The Powerful 6DREL-40 Automatic Turret Lathe -- and P&J Tooling

Machining a forged-steel truck bevel gear blank — 14 distinct cuts with tungsten carbide tools in just 5.88 minutes (including chucking time) — takes a team with plenty of horses to pull it . . . A TEAM LIKE THE **P & J 6DREL-40 AUTOMATIC** (NOW WITH 40 HORSEPOWER), PLUS JOB-ENGINEERED **P & J TOOLING.** Here's the team to choose for doing your tough jobs faster . . . and at a lower per-unit cost!

If you're looking for real productive power, it will pay you to look at the 6DRE-40 and 6DREL-40 Automatic Turret Lathes. Write for informative booklet describing these Automatics. Ask for Bulletin No. 128 . . . or ask the P & J Tooling Engineer to submit recommendations based on your sample parts or prints.



MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

POTTER & JOHNSTON Co.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
PRATT & WHITNEY
DIVISION NILES – BEMENT – POND COMPANY

PRECISION PRODUCTION TOOLING — FOR MORE THAN FIFTY YEARS

WRITE DIRECT OR CONTACT YOUR NEAREST PRATT & WHITNEY BRANCH OFFICE

BIRMINGHAM • BOSTON • CHICAGO
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EXPORT DEPT., PAWTUCKET, R. I.

AGENTS: DALLAS, THE STANCO CO.
HOUSTON, WESSENDORFF, NELMS & CO.

MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED



Illustrated is Madison-Kipp Lubricator Model FD installed as original equipment on a ⅜" by 20' Cincinnati Press Brake, manufactured by the Cincinnati Shaper Co., Cincinnati, Ohio.

MADISON-KIPP

Fresh Oil . . . by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

MADISON-KIPP CORPORATION

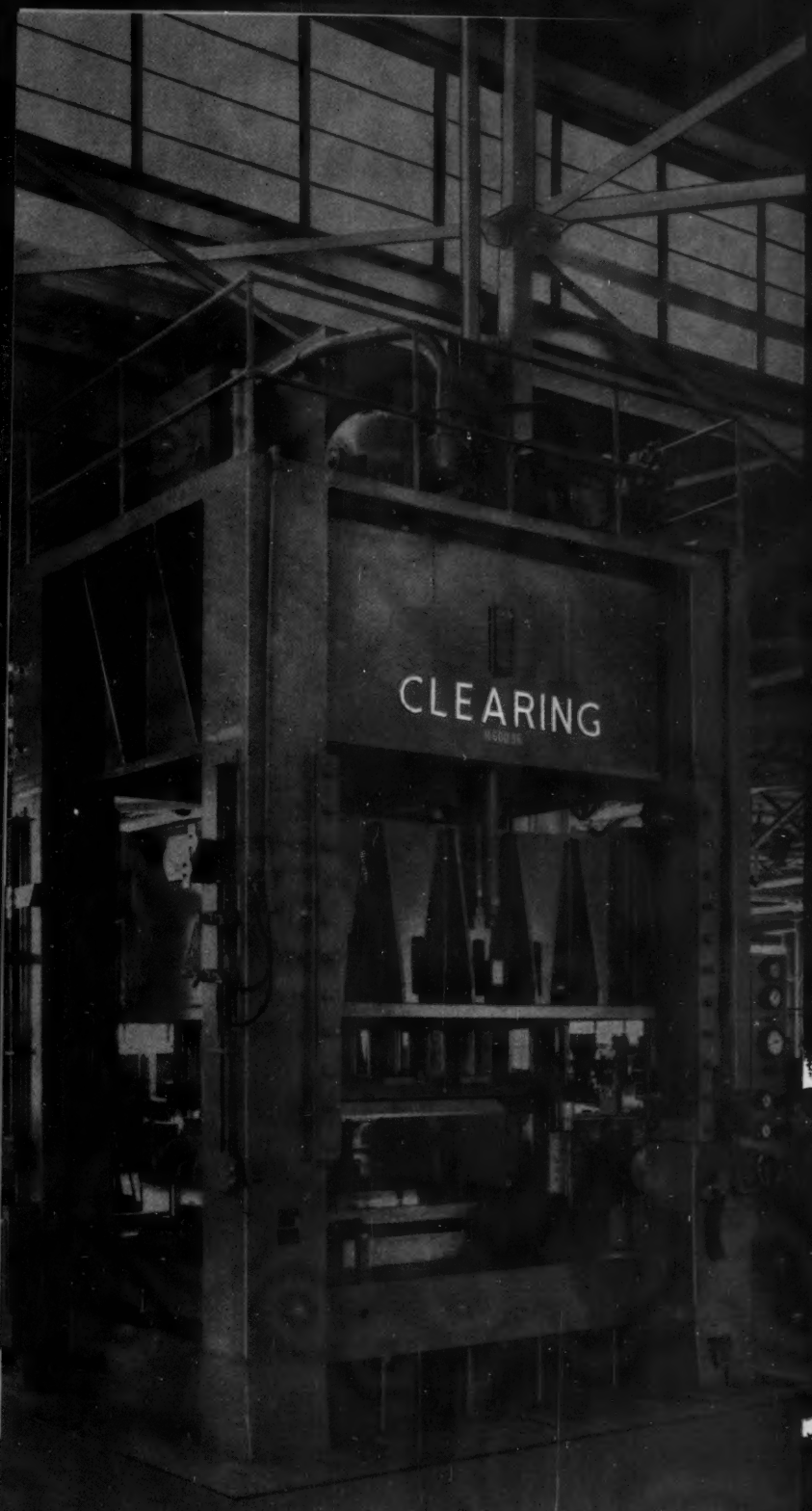
203 Waubesa Street, Madison 10, Wis., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marias, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

For more information on products advertised, use Inquiry Card, page 243



How a CLEARING PRESS BOOSTS Die Making Capacity for BRUST TOOL

Brust Tool Mfg. Company moved into their new plant in Franklin Park, Illinois, recently with a plan for a truly modern shop having top facilities and equipment for large scale die making. Their plans included the 600 ton Clearing hydraulic press shown here. Brust's new Clearing, with its bed area of 96" x 96", makes it possible to test and make sample runs from large area dies and actually broadens the range of die work they are able to do.

If your plans for the future include expanding your press working facilities or retooling with more productive equipment, call on Clearing Machine Corporation.

CMC

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION • 6497 West 65th Street, Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

For *positive* bearing protection on Military Jeeps-



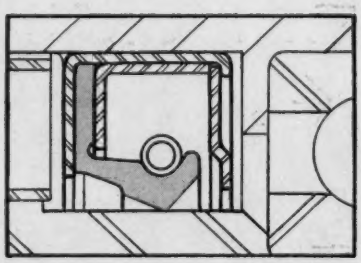
Every Willys Military Jeep has a "transfer case" which provides for 2 functions: (1) Engaging the front axle drive; (2) Engaging the emergency low gear ratio. Spicer uses dependable Garlock KLOZURES to protect the front and rear bearings on the output shaft of this important mechanism.

Spicer uses KLOZURE* Oil Seals

The Spicer "transfer case" in a Military Jeep must be able to function smoothly under the most adverse operating conditions. Thus, the bearings on the output shaft (which operates at speeds up to 4,000 R.P.M.) need *positive* protection against dust, mud, and water; the bearing lubricant must be sealed in. This job calls for a superior oil seal. Spicer engineers rely on KLOZURE garter-spring Model 65.

Take a tip from Spicer, who for 50 years has been manufacturing precision parts for the automotive industry. Standardize on KLOZURE Oil Seals—the best bearing protection money can buy.

There's a service-tested KLOZURE model for every bearing application. For complete information contact your Garlock representative or write for KLOZURE Catalog No. 10.



Installation of Model 65 KLOZURE Oil Seal on the output shaft bearing of the Spicer "transfer case."

*Registered Trademark

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit Houston • Los Angeles • New Orleans • New York City • Palmyra, (N.Y.) • Philadelphia • Pittsburgh • Portland (Ore.) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

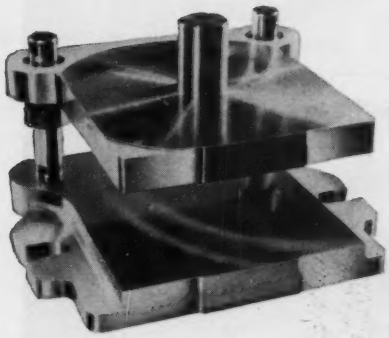
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

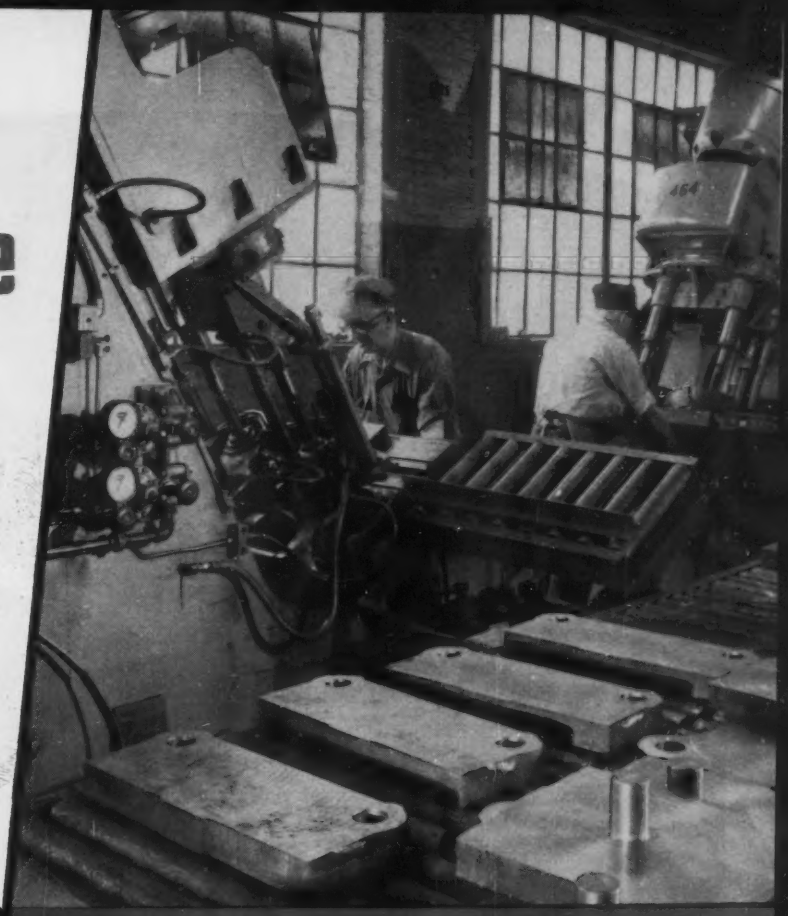
PACKINGS, GASKETS, OIL SEALS
MECHANICAL SEALS
RUBBER EXPANSION JOINTS

For more information on products advertised, use Inquiry Card, page 243

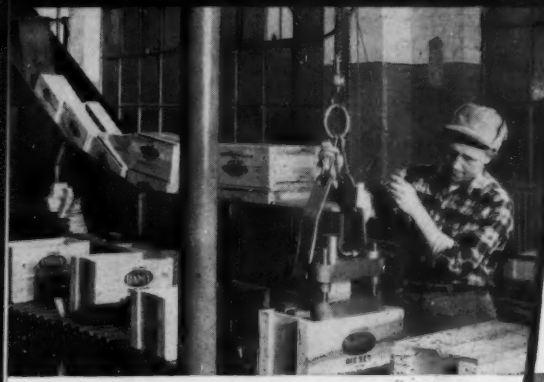
Fastest die set service ever



. . . made possible by Danly's unique mass-production and distribution system.



At the main Danly plant . . . high speed precision drilling. Interchangeable fixtures accommodate the full range of standard die set sizes.



At your Danly Branch plant . . . shipping die sets to your order. Up-to-date procedures and facilities assure fastest delivery.

To make your tooling program move faster, Danly mass produces interchangeable, precision die set parts . . . stocks them at your local Danly Branch ready for quick assembly to your order and delivery to you. With Danly, from the time you place your order until the set is delivered to you is a matter of only a few days. This extra fast delivery starts at the main Danly plant in Chicago where two complete high-speed production lines turn out a wide variety of precision die set parts. Held in ample stock by your local Danly Branch, these interchangeable parts are assembled to your order and delivered immediately. Don't let lagging die set delivery bog down *your* tooling program. Order from your Danly Branch and get the fastest service . . . ever.

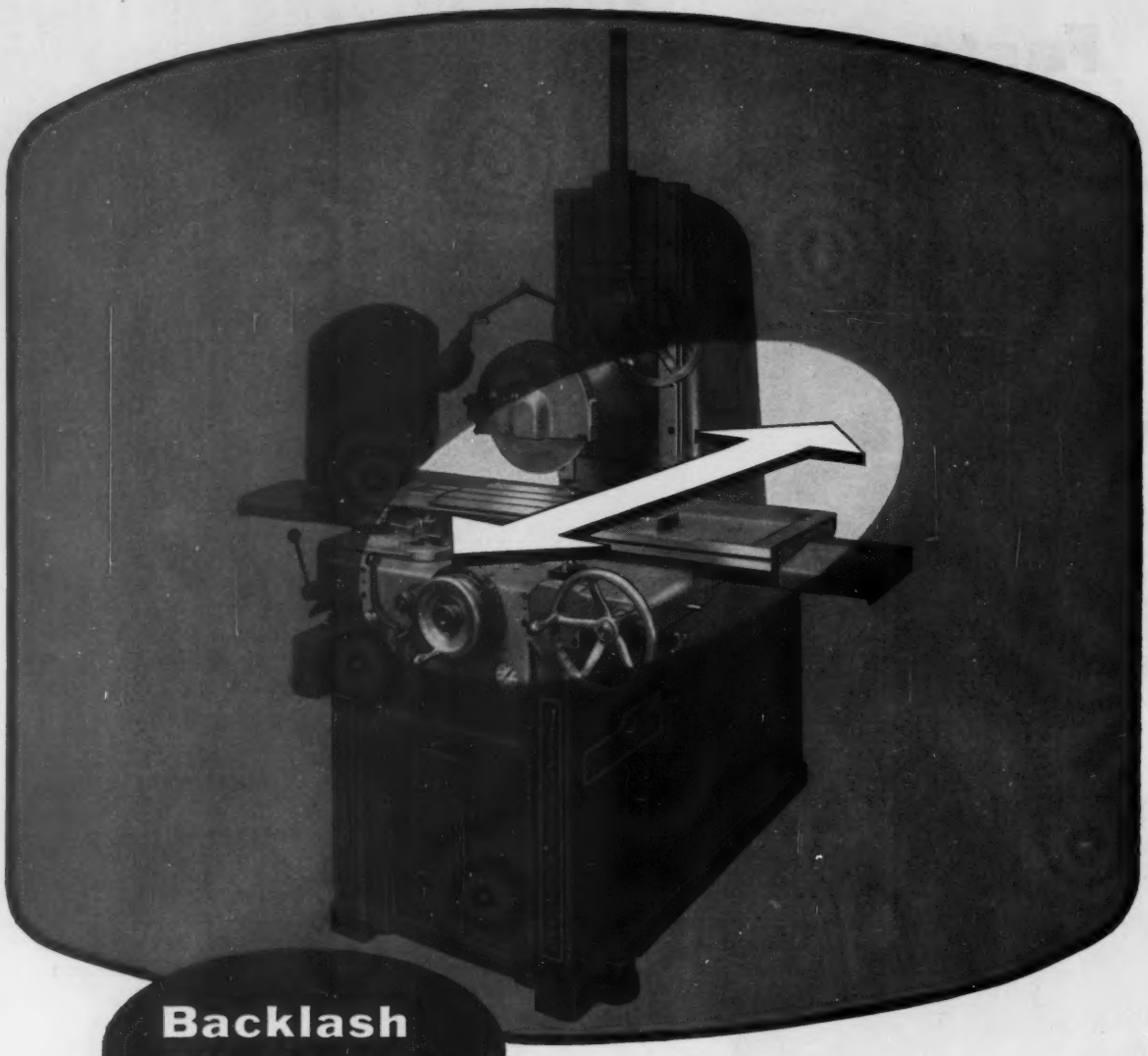
DANLY®

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

Fast, nationwide delivery from these branch plants

*CHICAGO 50	2100 South Laramie Avenue
*CLEVELAND 14	1550 East 33rd Street
*DAYTON 7	3196 Delphos Avenue
*DETROIT 16	1549 Temple Avenue
*GRAND RAPIDS	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
*ROCHESTER 6	33 Rutter Street

*Indicates complete stock



Backlash Eliminator

Means More Work in Less Time

An important feature of the *1218 Hydrabrasive Surface Grinder* is its crossfeed backlash eliminator. Instead of having to "back off" the crossfeed adjustment and "come up" to the proper setting each time, the backlash eliminator permits fast precision tranverse adjustments in either direction. You can be sure a movement of .0001" on the crossfeed handwheel equals a .0001" movement of the saddle.

This is another reason why the 1218 Hydrabrasive turns out so much work so accurately, and so easily. For detailed catalog on this fine, modern surface grinder, write Abrasive Machine Tool Company, 12 Dunellen Rd., East Providence 14, R. I.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

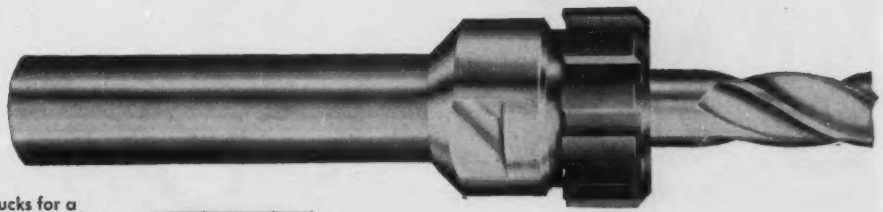
For more information on products advertised, use Inquiry Card, page 243

UNIVERSAL CHUCKS

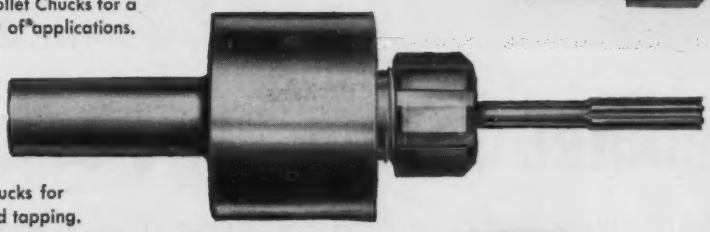
SAVE TIME • SAVE MONEY



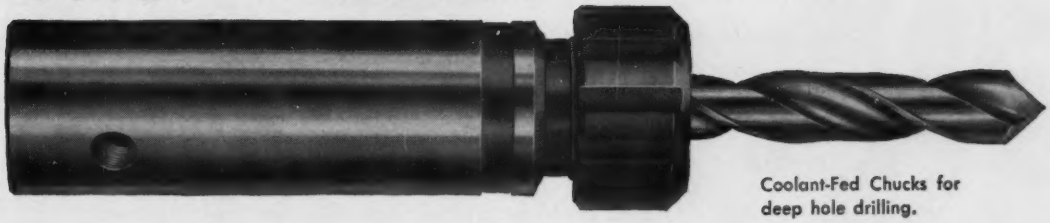
- low first cost, due to simple design.
- wrap-around gripping action eliminates scored tool shanks.
- precision manufacturing assures tools running true.
- sizes from 1/16" to 1½", shanks to fit any type machine.



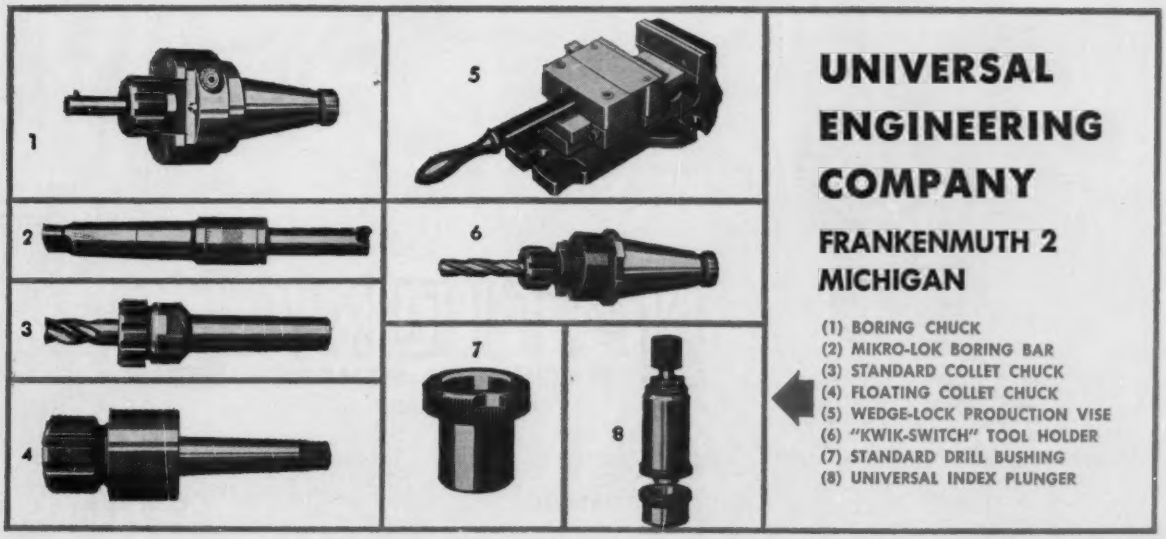
Standard Collet Chucks for a wide variety of applications.



Floating Chucks for reaming and tapping.



Coolant-Fed Chucks for deep hole drilling.

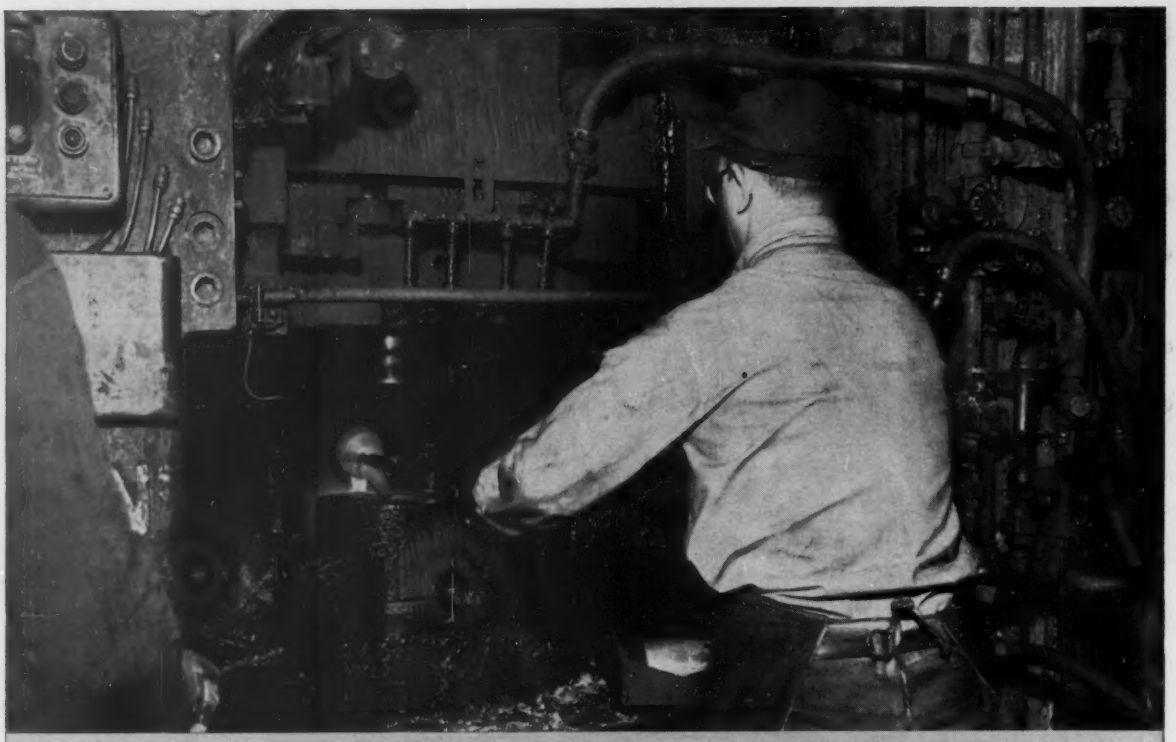


UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 2 MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

For more information on products advertised, use Inquiry Card, page 243

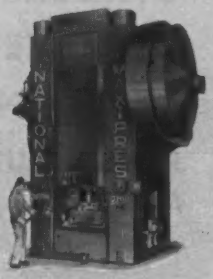


MODERN FORGING AT Ford

This new-design High Speed Forging MAXIPRES is hot-extruding ball-joint suspension forgings at the Ford Motor Co. Forge Plant, one of the world's largest, in Canton, Ohio.

Ford uses 7 MAXIPRESSES, 8 REDUCEROLLS and 24 NATIONAL High Duty Forging Machines—39 units in all—for many of its forgings.

If you have a forging problem — large or small, hot or cold, ferrous or non-ferrous — let us help you solve it. Send us your prints and sample parts, or better yet, visit us. No obligation.



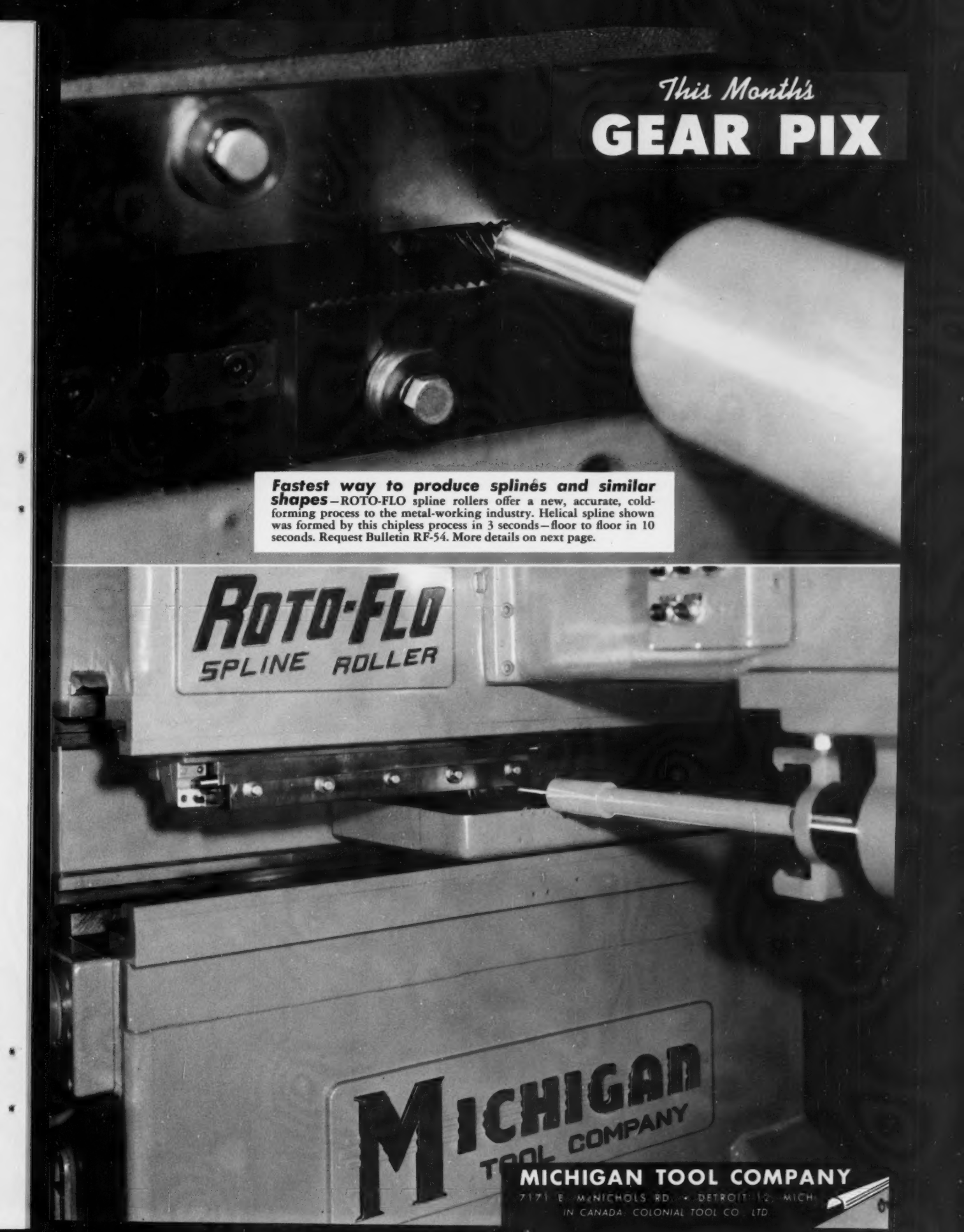
MAXIPRESSES are available in 13 sizes from 300 to 8,000 tons.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

For more information on products advertised, use Inquiry Card, page 243



Fastest way to produce splines and similar shapes—ROTO-FLO spline rollers offer a new, accurate, cold-forming process to the metal-working industry. Helical spline shown was formed by this chipless process in 3 seconds—floor to floor in 10 seconds. Request Bulletin RF-54. More details on next page.

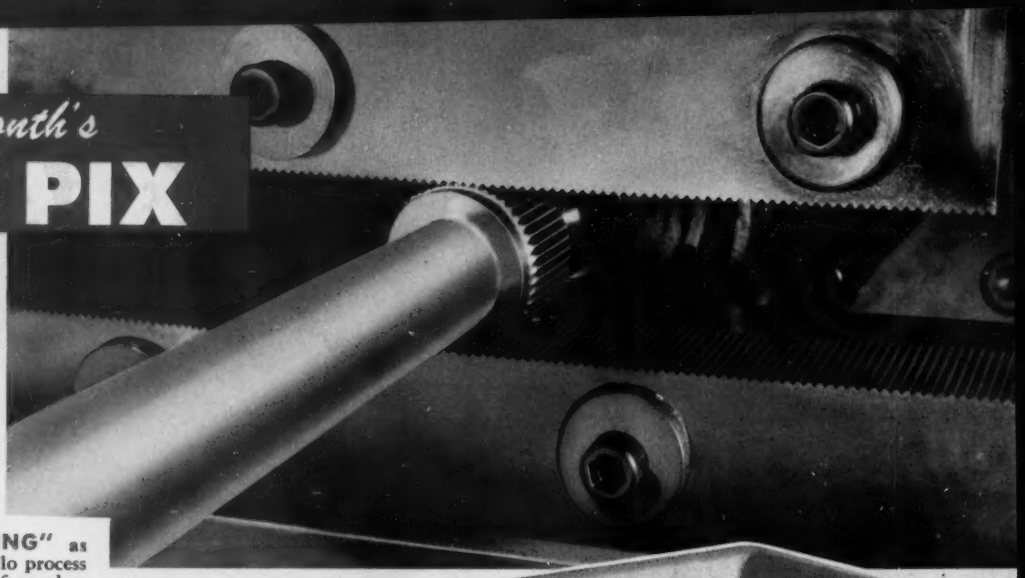
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD.

This Month's

GEAR PIX



"CHIPLESS MACHINING" as accomplished by the Roto-Flo process —a straight spline is being formed as it is rolled between the two forming racks. Roto-Flo produced parts have excellent surface finishes and are formed to close dimensional tolerances.



ONE of the standard models offered in the *Roto-Flo line is the 1537 with a capacity for rolling parts up to 2 inches in diameter. The stroke on these machines is variable, depending upon the size of the forming rack required for the part being produced.

SPLINES and other "tooth" forms, can be formed in a very few seconds by the Roto-Flo process, at a marked reduction in cost. As illustrated, this latest development by Michigan Tool Company in "chipless machining" presents designers with a new range of flexibility when specifying splines, serrations, and other similar shapes on external parts.



*Patent Pending

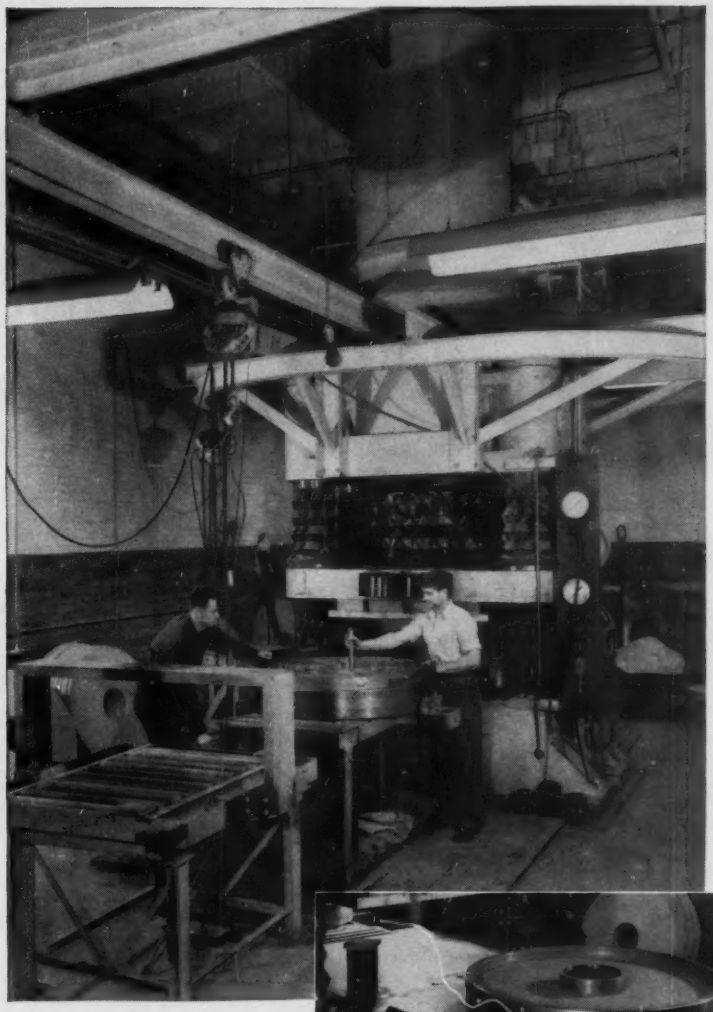
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD., WINDSOR, ONT.

At MACKLIN COMPANY JACKSON, MICHIGAN

"Our ELMES Press has DOUBLED PRODUCTION on Large Grinding Wheels"



The Macklin Company manufactures abrasive wheels in a complete range of shapes and sizes for all types of grinding work. One of their newest production aids for processing large wheels up to 48" in diameter is the ELMES® 2000-Ton Abrasive Wheel Forming Press shown at left. The press is lever controlled with two pressures available. Its smooth performance and rugged construction has enabled the Macklin Company to *double their output* of large size wheels.

This actual "case history" in one particular field is typical of the outstanding performance of Elmes Hydraulic Presses of *every* type, such as metal drawing and forming, forcing, bending, straightening, forging, hobbing, etc. Whatever your operation, you *profit* when you "put your pressing problems up to Elmes".

Let Elmes assist you in selection or design of the right press for your production. Recommendations and cost estimates are yours for the asking.



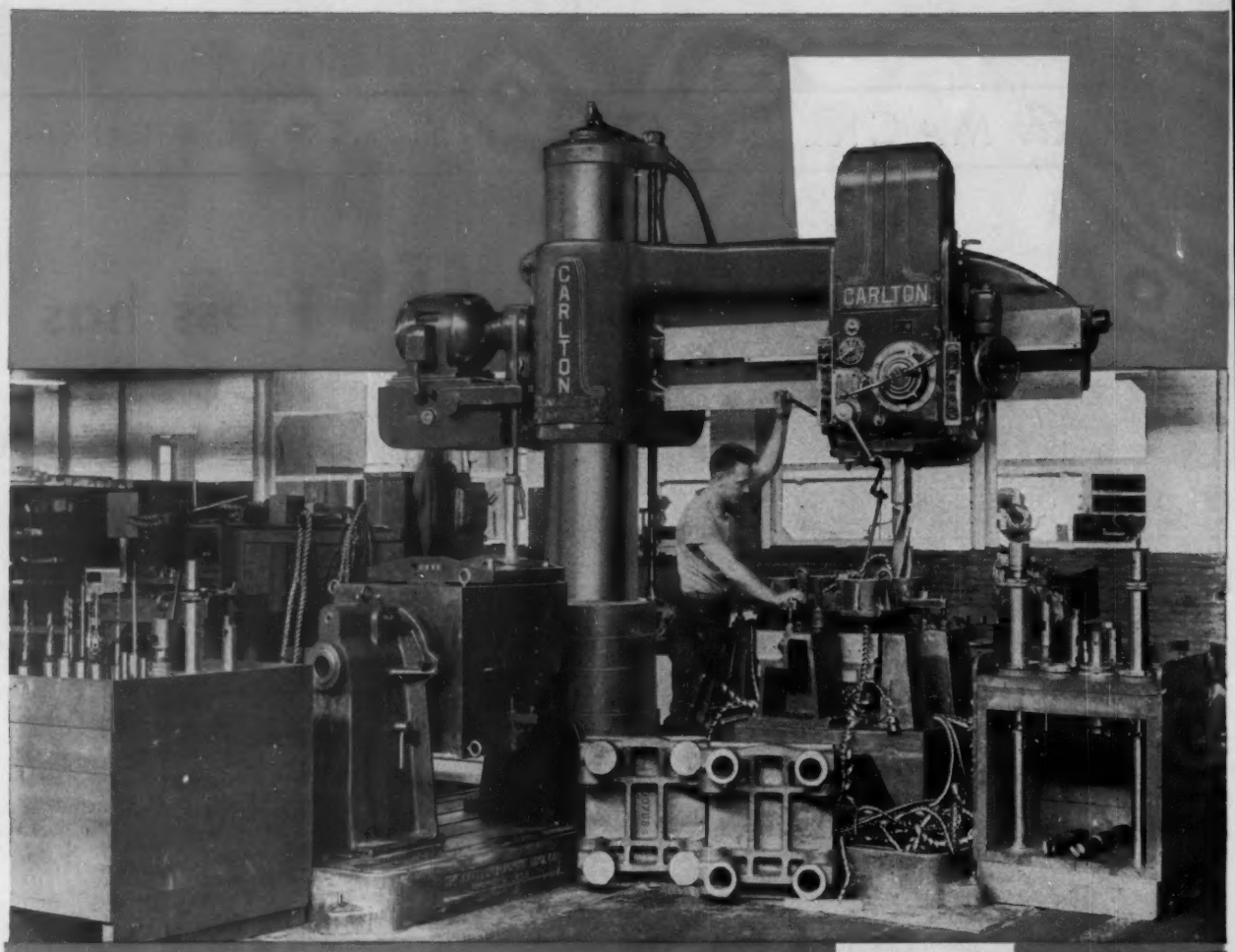
Above: Stripping the mold from a 42" x 2" x 12" Macklin Grinding Wheel that has just been pressed on the Elmes 2000-Ton Forming Press. Photo at right shows the same wheel before pressing. The abrasive material has been leveled in the mold and is ready for the pressure forming operation.

HYDRAULIC PRESSES
(Standard or Custom-Built)
for:
DRAWING & FORMING
FORCING
BENDING
STRAIGHTENING
DIE SINKING
FORGING
COINING
POWDERED METALWORKING
TUBE REDUCING
ETC.

AMERICAN STEEL FOUNDRIES

ELMES ENGINEERING DIVISION

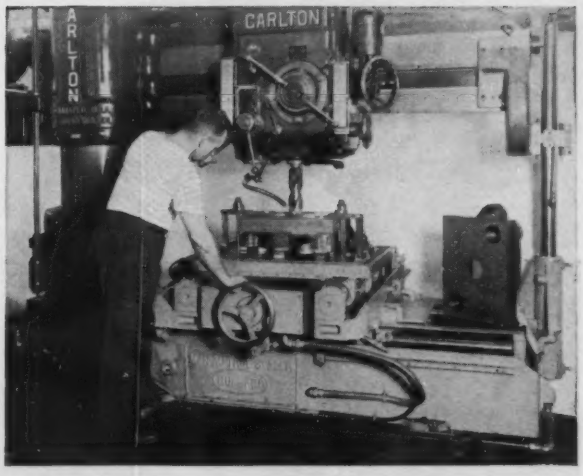
hydraulic presses and equipment .... 1162 TENNESSEE AVE., CINCINNATI 29, OHIO



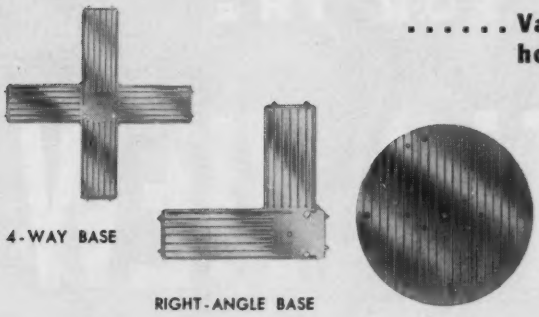
Carlton RADIAL DRILLS

Revolving Stands used under Carlton radial drills reduce boring and drilling costs 24.3% at Reed-Prentice Corp., Worcester, Mass. In the photo directly above, the Carlton radial has a double right-angle base which permits operator to work on the job at right while the one on the other base is being set up. This arrangement keeps the spindle drilling continuously.

Carlton Radial Drills are perfectly suited to production drilling, and when properly tooled, can reduce costs considerably over the horizontal method. The pushbutton control simplifies and speeds up operation. The low hung drive assures the necessary rigidity. And the accuracy and precision with which the Carlton column clamp performs eliminates needless clamping and unclamping.



Drilling versatility and accuracy. Holes from 5" to ⅝" in diameter are drilled in this set-up which shows a Bullard Man-Au-Trol spacer mounted on a 4A Carlton radial drill. Using the guide, the operator drills and bores a 5" center hole and two 4" tie-bar holes, and drills and taps 24 small holes in this Reed-Prentice plastic injection molding machine die plate.



. . . . . Variety of bases fit all production hole drilling requirements.

Carlton radial drills can be furnished with any of seven different types of stationary bases, three of which are shown here. And, there's a special track type mounting and a variety of plain or uni-tilt tables and revolving jigs . . . so that with Carlton you're sure to get the most efficient and profitable set-up for your requirements.

Cut Costs 24.3% at Reed-Prentice

Carlton Engineered . . . Carlton Tooled. Carlton engineers will be glad to work with your engineers in recommending the most efficient tooling for your Carlton radial drill . . . in making time studies and furnishing tooling costs. Just send us your requirements and we'll submit our recommendations promptly and without obligation.

Use convenient coupon. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

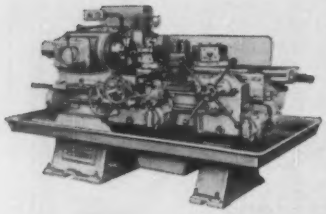
Gentlemen: Send us your recommendation on how the Carlton radial drill, properly tooled, can save us money on the attached drilling requirements.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____





A NEW 3-WAY MARKETING SERVICE THAT HELPS YOU ACQUIRE NEW MACHINE TOOLS

Jones & Lamson's new 3-Way Marketing Service permits you to see ahead . . . and plan ahead . . . without sticking your neck out. This new service offers you a choice of 3 sound methods by which you can obtain new machine tools on terms best suited to your own individual requirements. The three methods: outright purchase; "pay-from-productivity" on a 1-to-5 year basis, at interest rates as low as 3¼%*; or any of 4 variations of a truly flexible lease plan.

*(add-on rate)

JONES & LAMSON MACHINE CO.
512 Clinton St., Springfield, Vermont, U.S.A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES • AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES
AUTOMATIC THREAD & FORM GRINDERS • OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS

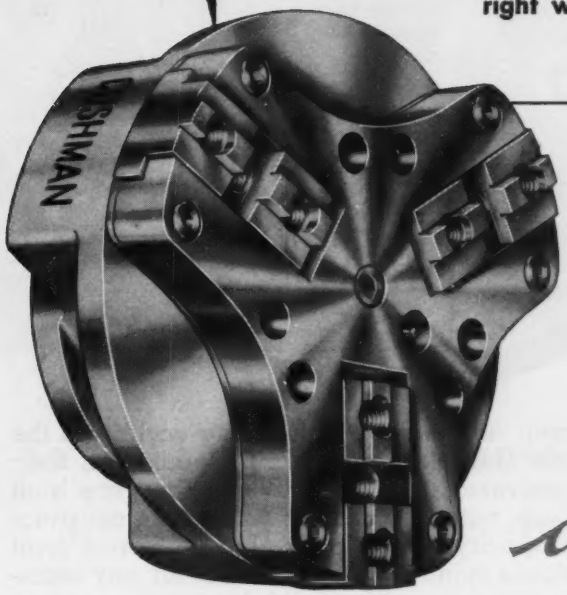
For more information on products advertised, use Inquiry Card, page 243

CUSHMAN

gives you CHUCK-ABILITY



CHUCK-ABILITY: **The ability to SPEED your work ... IMPROVE your products ... and REDUCE your costs ... through design and selection of the right work-holding devices**



Remember-
You can't machine it economically unless you hold it right

an example

... is Cushman's Aluminum Body Wedge-Type Air Operated Chuck, the answer to industry's demand for a lightweight, low inertia chuck for high speed machine tools. The surface of all parts subject to wear are of hardened steel.

To find out what Chuck-Ability can do for you, write Cushman for Catalog No. PO-64-1953 fully describing and illustrating Cushman Air Operated Chucks, Cylinders and Accessory Equipment; or, should you have a special work-holding problem, consult the Cushman Engineering Department.

THE CUSHMAN CHUCK COMPANY

815 Windsor Street **Hartford 2, Connecticut, U.S.A.**

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1862

Manufacturers of

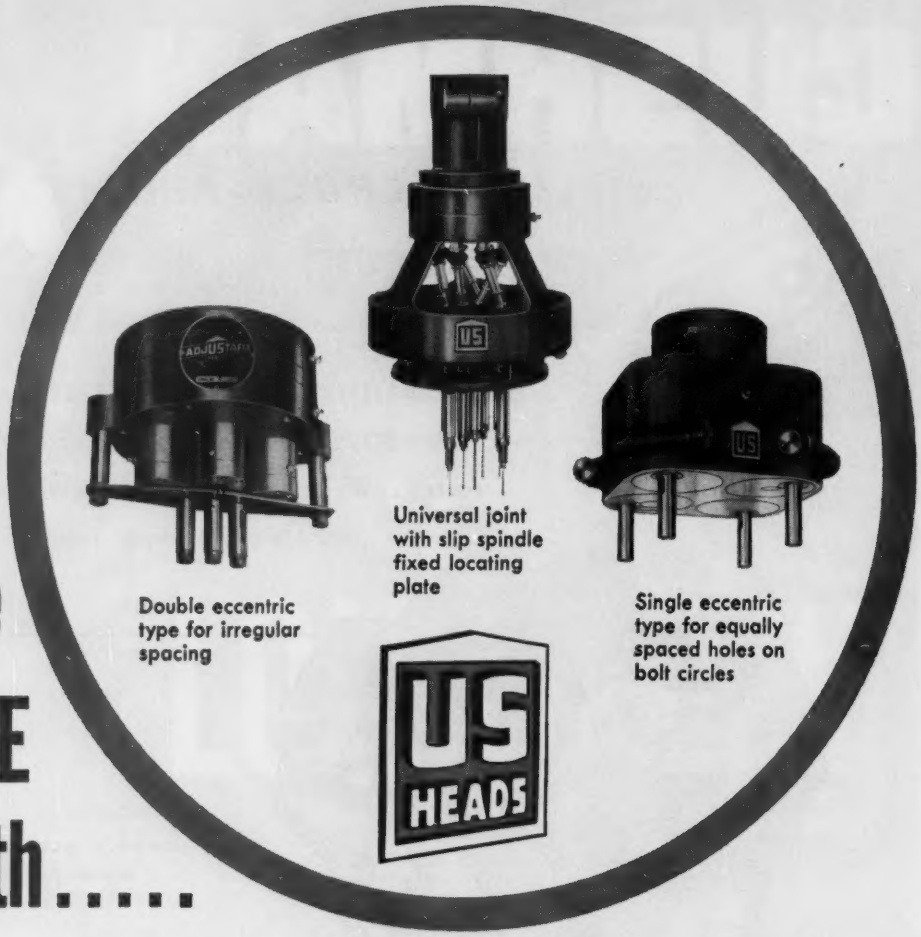
Air Operated Chucks, Cylinders, and Accessory Equipment ... The Cushman Power Wrench ... Cushman Manually Operated Chucks and Face Plate Jaws.

Ask your Industrial Distributor

A WORLD STANDARD FOR PRECISION

4C554R

It's the wHOLE Truth.....





Machine tool men "in the know" have long acclaimed the "US" Adjustable Multiple Spindle Drill Heads with their quick-change universal joint assemblies. They are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating.

The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

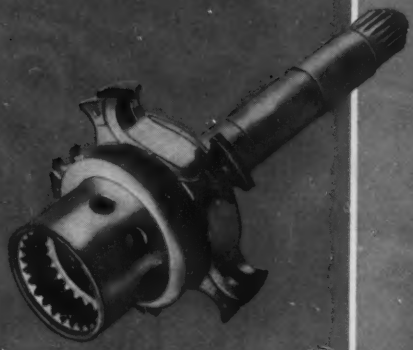
Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

UNITED STATES DRILL HEAD CO., 616-618 Burns St., Cincinnati 4, Ohio

For more information on products advertised, use Inquiry Card, page 243



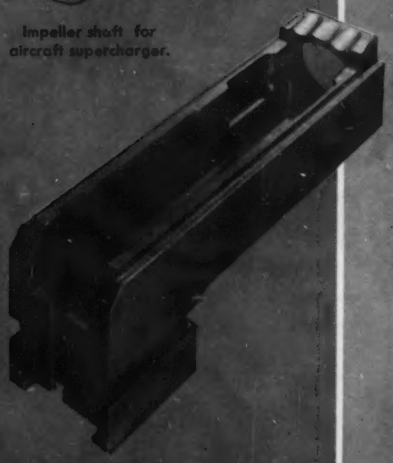
Pinion carrier for an aircraft planetary reduction gear.



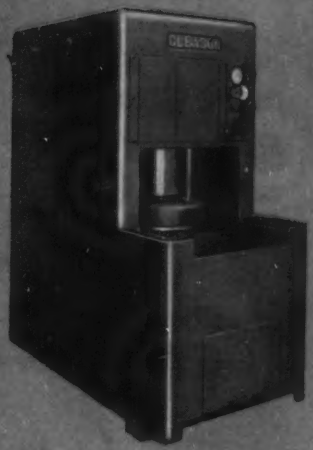
Impeller shaft for aircraft supercharger.



Aircraft cam gear.



Breech block for an automatic rifle.



The Gleason No. 26 Quenching Press for parts up to 25″ in the maximum dimension.

The Gleason No. 140 Quench Machine for shafts and similar parts ⅛″ to 4″ in diameter, up to 43″ in length.



How to hold parts like these to close tolerances during quenching

Are you troubled by warpage or distortion of precision parts during hardening?

If you have this problem, Gleason Quenching Equipment can help solve it with substantial savings in costs.

This equipment provides automatic, controlled quenching of flat, round, irregular, or shafted parts insuring alignment and minimizing distortion.

For round, flat or irregular parts up to 36″ in the maximum dimension there are three sizes of Gleason Quenching Presses of the type shown at the top right.

For shafts or similar parts there is the Gleason Rolling Quench Machine, shown at lower right. It accommodates shafts from $\frac{9}{16}$″ to 4″ in diameter, from 6″ to 43″ in length, and can handle parts with integral cams, gears or shoulders up to 8″ in diameter.

In all these machines the heated part is held under pressure. Flow of the quenching fluid to each portion of the heated part is accurately controlled at preset rates during all stages of the quenching cycle.

In the Quenching Presses precision dies hold the part in alignment and direct the flow of quenching medium during the quenching cycle. In the Rolling Quench Machine the part is rolled under controlled pressure. Relative pressures applied to the various portions of the part are accurately and automatically controlled.

The use of Gleason Quenching Equipment eliminates the need for any subsequent straightening. This is important for two reasons: (1) It saves one operation, reducing production costs. (2) Hardened parts which do not require straightening have less residual stress. Further information will gladly be sent on request.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

See these machines in Booth 454

AT THE NATIONAL METAL EXPOSITION

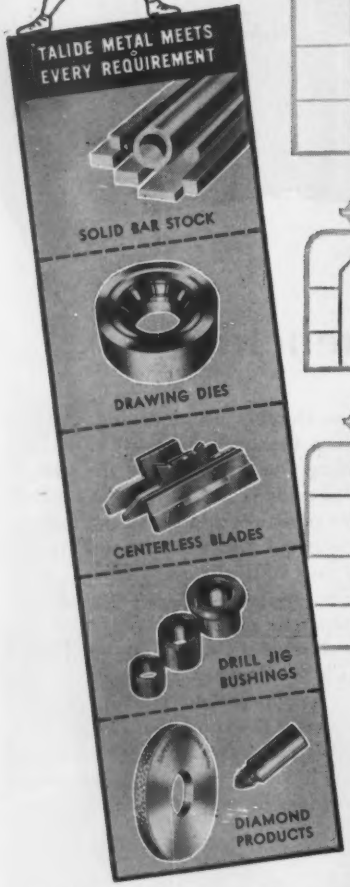
Chicago November 1-5, 1954

40



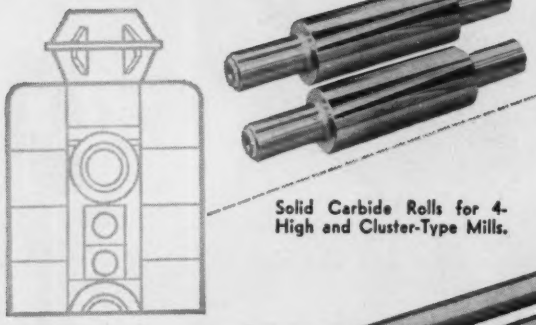
Talide ROLLS double production of your mill





Send for New 84-Page Catalog 54-G or Ask for Sales Engineer to Call.

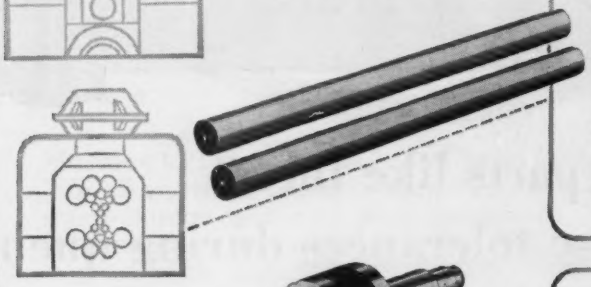
Metal Carbides Corp., Youngstown 7, Ohio



Solid Carbide Rolls for 4-High and Cluster-Type Mills.

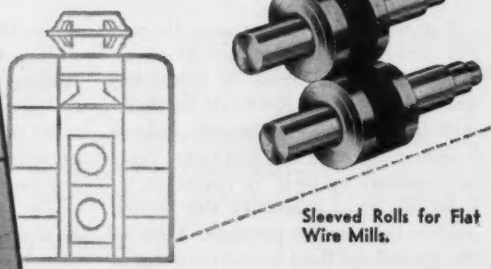
1600 to 20 coils

LARGE PITTSBURGH STRIP STEEL PRODUCER reports rolling 1600 coils of low carbon, high carbon, stainless and alloy steel strip with Talide rolls before same needed regrinding. Best previous service life obtained with steel rolls averaged between 16 and 20 coils.



168 to 7 hours

LEADING OHIO STRIP STEEL PRODUCER averages 750 coils of various types and analysis between grinds, enabling them to operate their cold rolling mill continuously without roll changes for 7 days, 3 turns per day. Previous steel rolls used averaged 6-8 hours, necessitating 3 or 4 roll changes per day with considerable down-time.



Sleeved Rolls for Flat Wire Mills.

50 to 2 coils

LARGE STEEL PRODUCER of straight chrome and nickel-chrome stainless steel strip now operates continuously for 3 turns or more with Talide rolls, whereas with steel rolls it was necessary to change 7 or 8 pair per turn. 50 coils are now rolled per regrind compared to 2 coils with steel rolls.

METAL CARBIDES CORPORATION

MC TALIDE

YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES

HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS

OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

For more information on products advertised, use Inquiry Card, page 243



Do YOU Know What WE Know About Speeds and Feeds?



Let us tell you! *This new Monarch Speeds and Feeds Booklet will better your production.* It's full of basic material and data on all commonly turned materials —invaluable information for production men and lathe operators; for engineers, foremen and methods departments.

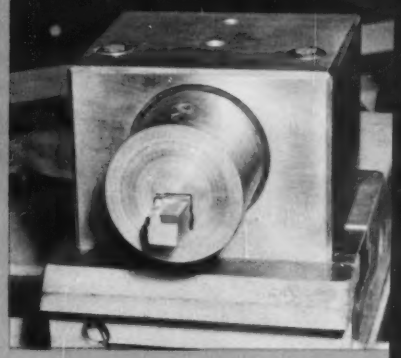
This new report from the continuing Monarch machinability research program is a valuable tool that you'll want to put in the appropriate hands in your organization without delay. A copy is yours, without cost, as a Monarch service.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

See Next Page For Details



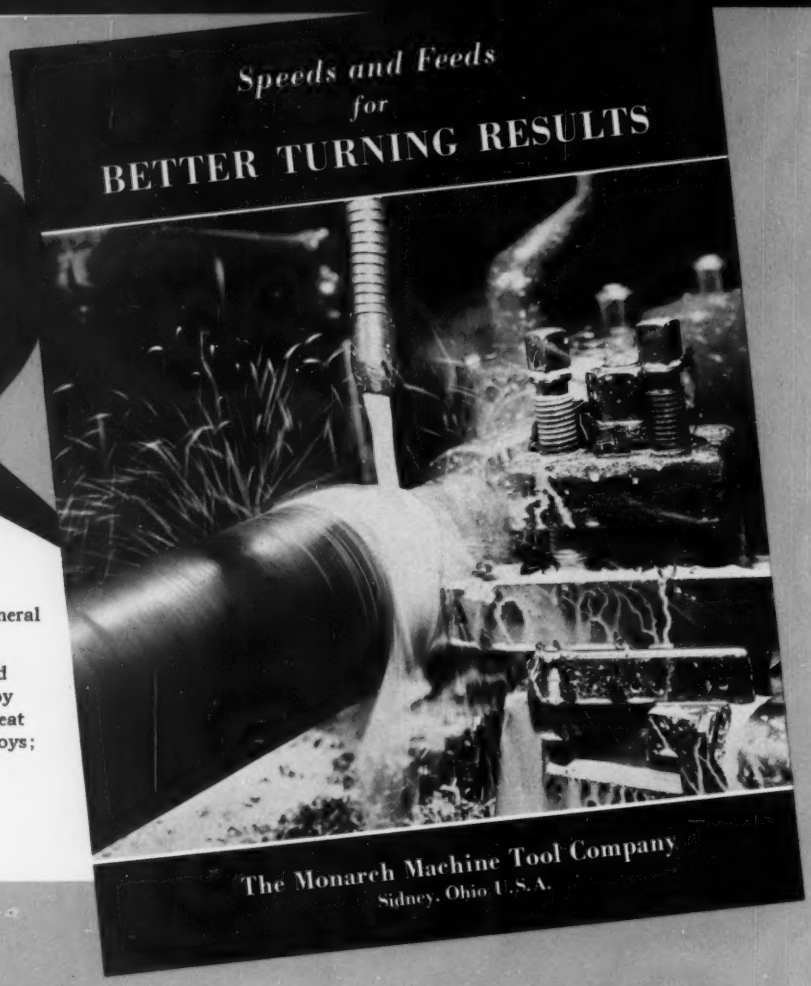


▲ Close-up of Dynamometer Used in Monarch Tests.

◀ Monarch Machinability Test Lathe in Action, With Typical Instrumentation.

The last word in turning–

Fresh off the Press!



PARTIAL LIST OF CONTENTS

SUBJECTS—Tool Angles; Machinability Ratings; Speed and Feed Charts; General Practice; Coolant; Horsepower.

MATERIALS—These subjects are discussed as pertinent to: Plain and Carbon Alloy Steels; Tool Steels; Stainless Steels; Heat Resistant Alloys; Cast Iron; Nickel Alloys; Copper Alloys; Aluminum Alloys; Magnesium Alloys; Plastics.

TECHNICAL CUTTING DATA—TABLES

WHAT IT IS. This book tells *you* what our studies tell *us* about the basic facts of turning. No complete technical operations handbook, its primary purpose is to serve as your guide in establishing optimum machining conditions. Much of this information is original and available nowhere else. What information has been distilled from other sources has been re-evaluated from our own findings under down-to-earth shop conditions.

ITS SOURCE. The Continuing Monarch Machinability Research Program.

This project has been in operation for some years, under the supervision of full-time recognized specialists drawing on all Monarch facilities (see preceding page). Its scope consists of the continuing evaluation of *all machining factors* which have a bearing on getting the maximum practical output from carbide cutting tools.

ITS PURPOSE. With its facts, this booklet will guide you to better, more profitable turning practice, regardless of your equipment. Or, with Monarch lathes featuring single point turning and tracer controls, you'll get *from* your lathe all the productivity we build *into* it—and that's optimum productivity . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

To Get Your Free Copy of the Monarch *Speeds and Feeds* Booklet, FILL OUT THIS COUPON and attach it to your business letterhead.

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: I would like a copy of your Speeds and Feeds Booklet. Please send it to me without obligation.

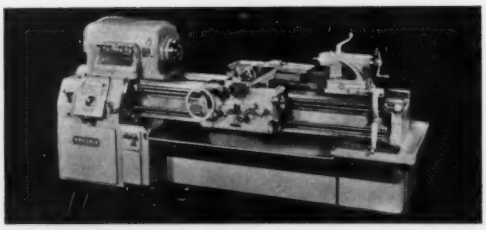
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A GOOD TURN FASTER . . . TURN TO MONARCH



See This New Monarch Line—Series 61. First and only complete lathe line with apron-controlled 4-way power rapid traverse.



"Solved! ...The case of the rusty fingerprints"

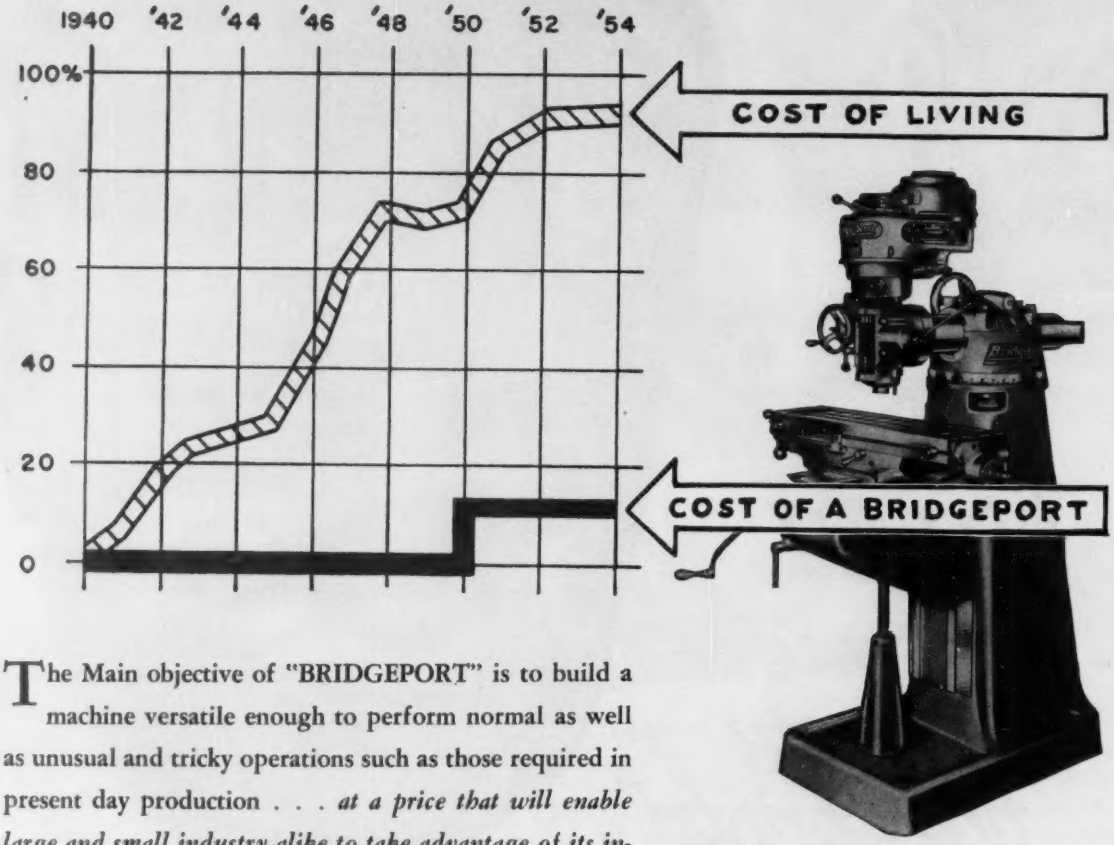
On one of his periodic visits to a large piston ring manufacturer, Sinclair Lubrication Engineer Don Rigg ran into a peculiar rusting problem. Mr. Rigg reports, "Customers were returning a considerable number of the company's rings because of rust spots and *rusty fingerprints.* Observation of the manufacturing process showed the rings were dipped in a rust preventive oil after being machined, then they were packaged and stored. *The fingerprints could only have come from the packers* and were due to failure of the rust preventive."

Mr. Rigg continues, "I recommended the use of Sinclair RUST PREVENTIVE 142 because it imparts a tough, protective film, impervious to finger marks and metal to metal contact. The fact that this company switched to Sinclair RUST PREVENTIVE 142 and has been using it exclusively for 3 years is ample proof of results."

SINCLAIR LUBRICANTS

Why not give a Sinclair Lubrication Engineer the chance to help solve *your* rust and lubrication problems. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

Holding the Price Line!



The Main objective of "BRIDGEPORT" is to build a machine versatile enough to perform normal as well as unusual and tricky operations such as those required in present day production . . . *at a price that will enable large and small industry alike to take advantage of its inherent and exclusive advantages.*

With quality and accuracy a prime consideration and never sacrificed to achieve a low selling price, we believe you will be interested in what has been made possible through modern tooling and machinery plus a cooperative supervisory and labor force in holding the price line of "Bridgeport Millers" over the past 16 years. The chart reproduced here tells the story far better than words.

If prices of various commodities in every day use had increased no more than the price of the "BRIDGEPORT" . . .

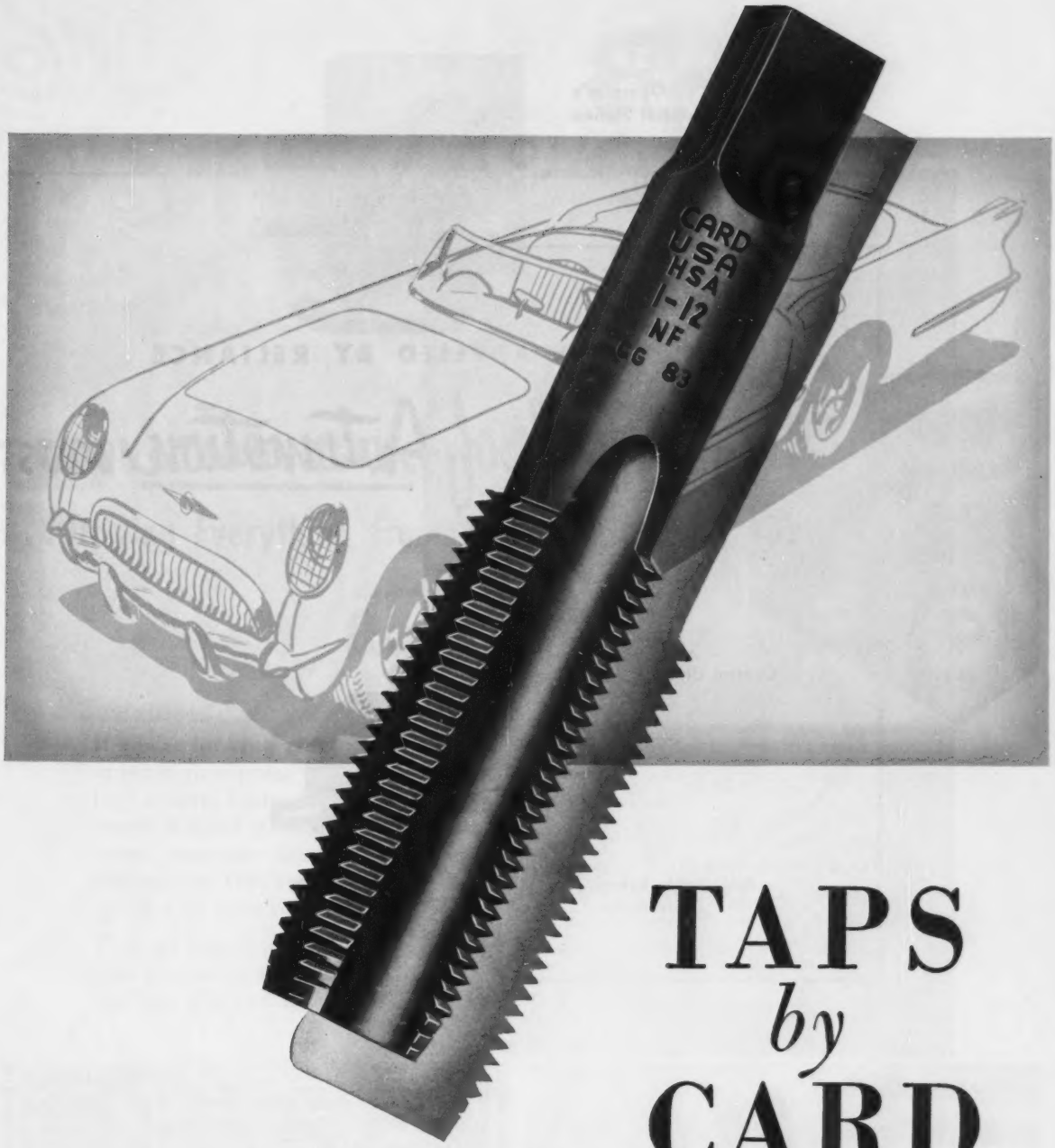
You could buy the following today . . .

	. . . at these prices	. . . instead of these
Housing	$7850	$18,000
Automobile	913	2,046
Food	727	1,500
Apparel	280	500
Fuel, Electricity	224	300

Ask your dealer . . or us . . to show how by "holding the price line", shops both large and small have been able to modernize their production through the more than 20,000 "BRIDGEPORTS" shipped in the past 16 years.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

For more information on products advertised, use Inquiry Card, page 243



TAPS *by* CARD

Whether its high precision on mass production or on special manufacturing lines, the extra value Card builds into its taps always pays off in performance.

The CARD Quality

Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle

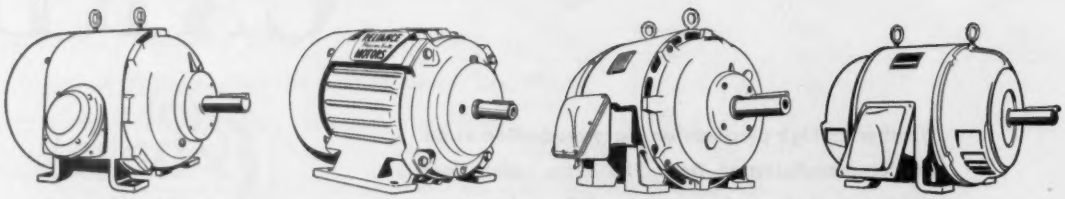
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BUILT AND APPLIED BY RELIANCE

THESE *Tools of Automation* BOOST



RELIANCE ELECTRIC AND ENGINEERING CO.

1077 Ivanhoe Road, Cleveland 10, Ohio • *Sales Representatives in Principal Cities*

RELIANCE Precision-Built MOTORS

RELIANCE V★S DRIVE ®

PRODUCTION EFFICIENCY IN EVERY INDUSTRY

. . . Driving Everything from Machine Tools to Paper Machines

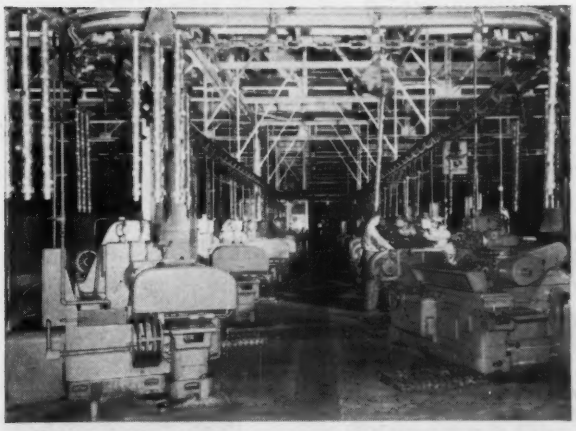
at less cost

If you're looking around for ways to improve your profit ratio—then take a look at these Tools of Automation: They include Reliance motors, adjustable-speed drives, electronic controls, and applied engineering. They've made a lot of companies a lot more competitive.

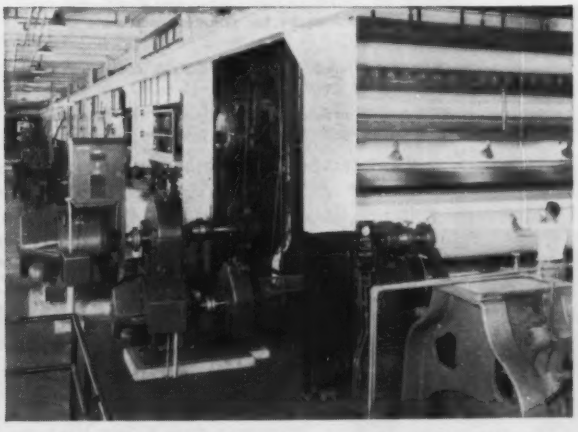
They are used in the world's largest and most completely automated engine plant. And you will find them delivering outstanding performance on machinery in paper, steel, machine tool, textile—in fact, in every industry.

The nearly 50 years of practical, first-hand experience Reliance has in developing, building and applying the Tools of Automation are available to help you automate a single machine . . . a process . . . or a complete production line. For all the facts, write for our new booklet, "The Tools of Automation."

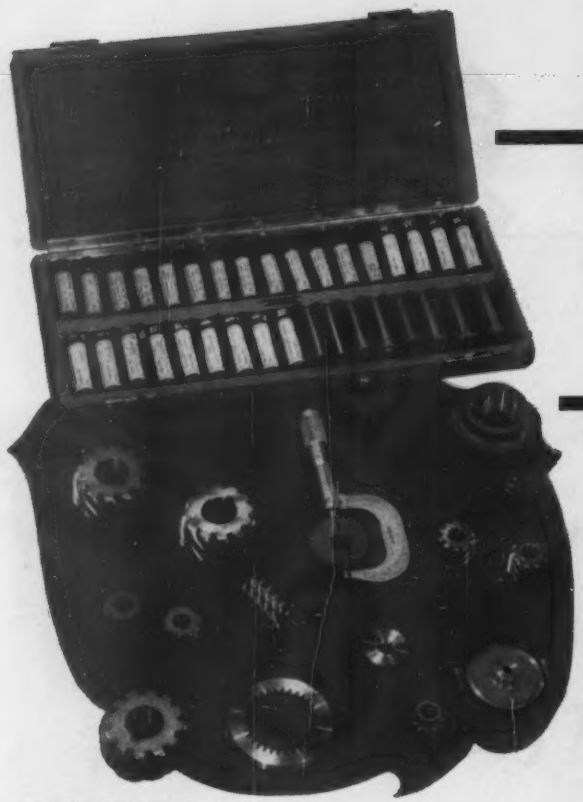
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In a camshaft production line, Reliance V★S Drive systems provide stepless, easily adjustable speeds for fast, precision machining. Optimum cutting speeds extend tool life, reduce downtime.



On a high-speed newsprint machine, the Reliance V★S Drive system provides unsurpassed accuracy and dependability, maintaining precise speed relationships and correct draw adjustments between all sections.



THE Van Keuren GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY . . . EQUIPMENT NEEDED:

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

- . . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.
- . . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.
- . . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- . . . definitions and exact formulas covering involute spur gears.
- . . . tables of involute tooth parts for standard addendum and stub tooth involute gears.
- . . . information, formulas and examples regarding the wire measurement of helical gears.
- . . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- . . . tables of wire measurement for involute splines.
- . . . tables of wire measurement for involute serrations.
- . . . tables of comparative measurement over three sizes of wires for use in involute profile checking.

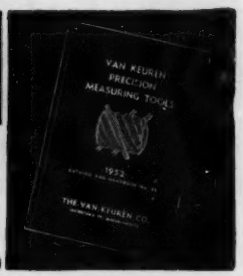
CATALOG and HANDBOOK No. 35 is available without charge by writing to: The Van Keuren Co., 178 Waltham St., Watertown, Mass. Ask for your copy.

VK
35th YEAR

THE Van Keuren CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

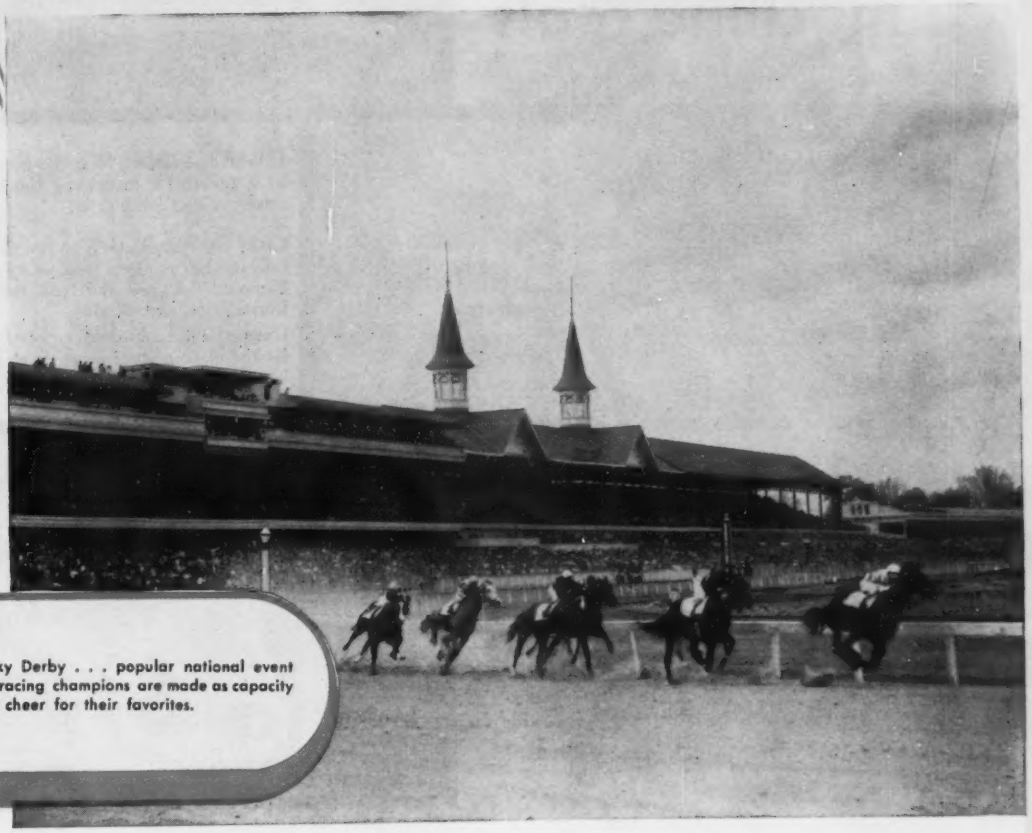
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages



For more information on products advertised, use Inquiry Card, page 243

LOGAN . . . a national participant in major fluid power advancements

SINCE 1916



Kentucky Derby . . . popular national event where racing champions are made as capacity crowds cheer for their favorites.

LOGAN AIR-DRAULIC® FEED-CONTROLLED CYLINDERS

POWER MOVEMENTS IN ANY DIRECTION — NO POWER UNIT REQUIRED

COMBINES

the fast-acting, economical low pressure operation of

AIR

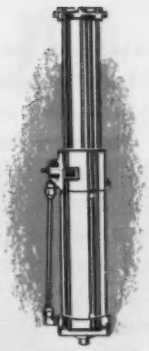
with the smooth, uniform controlled regulation of

OIL

5 ***STANDARD MOUNTING TYPES***

Standard bores from 3" to 8". Any stroke to 5 feet. For air pressures to 150 p.s.i.

Furnished for controlled feed with rapid return in either direction, or with controlled feed in both directions. Skip-feed movement can also be provided.



Air-Draulic Cylinder with Flange Mounting at Rod End

LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS

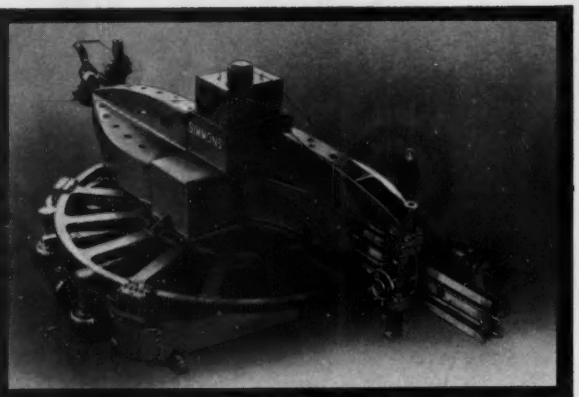
FREE CATALOG ON REQUEST

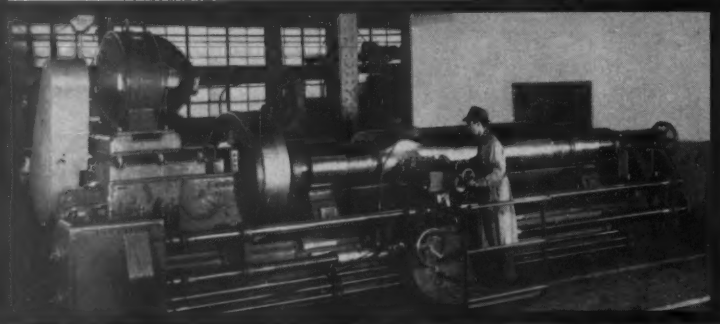
AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3
AIR and HYDRAULIC PRESSES, Cat. 51 • COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4
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SAVES TIME Logan AIR AND HYDRAULIC EQUIPMENT REPORT • MOTION

LOGANSPORT MACHINE CO., INC., 810 CENTER AVE., LOGANSPORT, IND.

"Special Purpose" machine tools





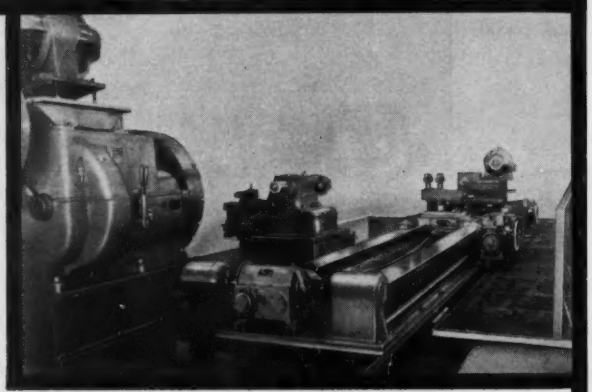
↑
36′ Circular Boring Mill, designed and built by Simmons for machining the forged steel turrets of battleship guns.

←
Lathe cuts indentations in tough alloy steel rolls used to produce steel safety floor plate. Simmons designed and built the tool for a leading steel producer.

Unusual Pit Lathe was especially designed for the machining of large dryer rolls. Lathe handles rolls up to 14′ diameter on 30′ centers.
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cut your costs permanently

—take load off standard tools— eliminate machining steps and operators



Labor costs are up...profit margins slimmer. What's the answer? Just this:

More and more economy-minded managements are finding "special purpose" machine tools the one way to cut costs permanently.

Simmons Machine Tool, uniquely geared to produce the large special machine tools that other builders shy from, is currently helping America's blue-chip metalworking plants modernize and *specialize* their production lines.

Our engineers work closely with theirs, determine the problem and how it can be solved. The answer may be a completely new tool, a battery of such tools, or in the modernizing and adapting of existing tools.

If you think—or even suspect—that a "special-purpose" machine tool might do your work better, quicker and cheaper, find out. Write, wire or phone Simmons today. We'll study your problem and make a quick recommendation.

SIMMONS MACHINE TOOL CORPORATION
1600 North Broadway, Albany 1, N. Y.
New York Office: 50 E. 42nd St.

Simmons...
for the large special machine tools that others seldom build

For more information on products advertised, use Inquiry Card, page 243

He isn't on your payroll.

He doesn't have a drawing account.

He doesn't have a desk in your office.

Nor a spot in your shop.

Yet he's been around quite a while.

He knows more about more things than you can shake a stick at.

His experience is infinite and his contacts are legion.



Best man you ever had working for you...

Quite a fellow!

You know him when you see him face to face.

To turn him around, turn this page.





He is an indispensable factor in the economy of the industrial world . . . the expediter who keeps hand and power tools, machine parts, accessories and manufacturing staples coming in order to keep plants going.

He is your nearest, quickest, most dependable source of supply. No other system of procurement has yet been devised to assure smoother, uninterrupted industrial operation.

The Industrial Distributor carries a myriad assortment of active items — in types, designs, grades and sizes to meet your specific needs as well as the needs of other manufacturers from whom you buy equipment, materials, assembly units and other production needs.

He also warehouses countless items of long-interval demand which otherwise would tie up your own capital—or expose you to the risk of slow-up or shut-down.

He knows where and how to obtain scarce or sorely needed requisites—thus sparing you the time and expense of searching for them yourself.

He explores the globe for new and improved appliances that may speed up your production, cut your costs, improve your product.

He is a veritable "encyclopedia" of information for keeping you up to date on new practices, processes and paraphernalia.

As a "clearinghouse" for your purchases from all sorts of producers far and near, your Industrial Distributor relieves you of a lot of accounting and other "paper work." By similarly serving such producers in their distribution, he ultimately brings you still further benefits.

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• Nicholson believes in and has adhered to this principle of MARKETING THROUGH SERVICE for more than 40 years. As a result, Nicholson Distributors and their field men learn how to WORK FOR YOU. They become experts on files and filing—right down into your shop where the right use of THE RIGHT FILE FOR THE JOB counts in the way you want it to count. • There are throughout the U.S. more than 875 near-at-hand Industrial Distributors of Nicholson and Black Diamond files; and over the years few of them ever leave us—or you.

NICHOLSON FILE COMPANY

PROVIDENCE 1, RHODE ISLAND

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

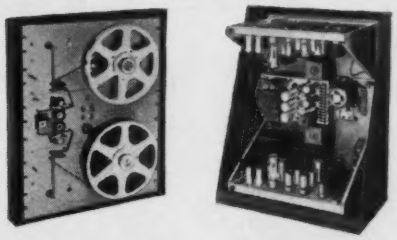
NICHOLSON U.S.A.

World's foremost manufacturer of

A FILE FOR EVERY PURPOSE

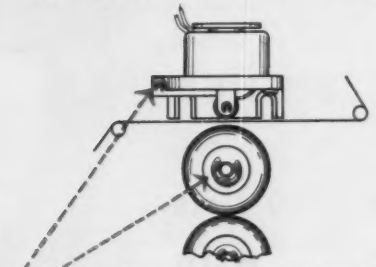
30 Waldes Truarc Rings Save Space and Time... Simplify Assembly and Disassembly

Potter's New Digital Magnetic Tape Handler



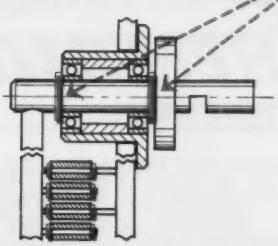
■ Prime requirements: fast starts, fast stops, fast tape speeds, great accuracy. Using Truarc rings, this new model starts and stops the tape within 5 milliseconds, has tape speeds up to 60 inches per second.

Solenoid Mount and Capstan Assembly



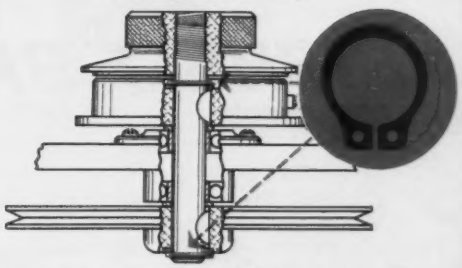
■ Miniature Truarc E-Rings on .040 diameter shaft and on continuously running capstans eliminate projecting bolts and screws. Rings permit rapid assembly and disassembly, fast replacement of worn rubber capstans.

Tension Shaft Assembly



■ Truarc E-Rings snap quickly into place, act as shoulders for the ball bearings with a minimum of friction. Additional Truarc Rings are used as spacers on shafts, can be located accurately to extremely close tolerances.

Reel Shaft Assembly



■ Truarc Standard Rings (Series 5100) hold the reel shaft assembly firmly in place and permit the use of quick-lock hubs so that the reel tapes can be changed in seconds as they are finished.

Potter Instrument Company, Inc., of Great Neck, L. I., uses 30 Waldes Truarc Retaining Rings in their new Model 902 High Speed Digital Magnetic Tape Handler. In addition to solving a variety of fastening problems, Truarc Rings facilitate the rapid acceleration and fast stopping needed in these machines.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble. They save time and increase operating efficiency.

Find out what Waldes Truarc Retaining Rings can do for you, toward saving costs and improving your product. Send your blueprints to Waldes Truarc Engineers for individual attention without obligation.



SEND FOR NEW CATALOG

WALDES

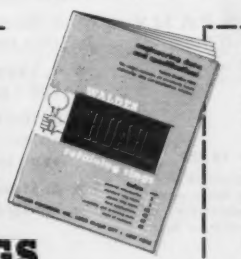
TRUARC

REG. U. S. PAT. OFF

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,383,947; 2,392,948; 2,416,852; 2,420,931; 2,428,341; 2,439,705; 2,441,848; 2,458,195; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,500,081 AND OTHER PATENTS PENDING



For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!

M 106

Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

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Name .....

Title .....

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Business Address .....

City ..... *Zone* ..... *State* .....

you can SAVE TIME and MONEY on jobs like this with the



...GISHOLT SPEED SELECTOR!

HERE'S WHY:

No manual gear shifting! You simply turn this hand wheel or touch a trip lever (for Direct or Pre-set operation). Shifting is automatic—by hydraulic power—while the operator positions the new tools for the next cut.

It's all so much simpler with the Speed Selector. There's no need for time-wasting computations, no mental effort, no physical effort. With simple controls, either direct or prearranged, the operator gets the ideal f.p.m. cutting speed for each cut. And it's *much faster,* of course!

The Speed Selector is standard on Gisholt Nos. 4 and 5 Ram Type Turret Lathes and on all Gisholt Saddle Type Lathes.

GISHOLT MACHINE COMPANY

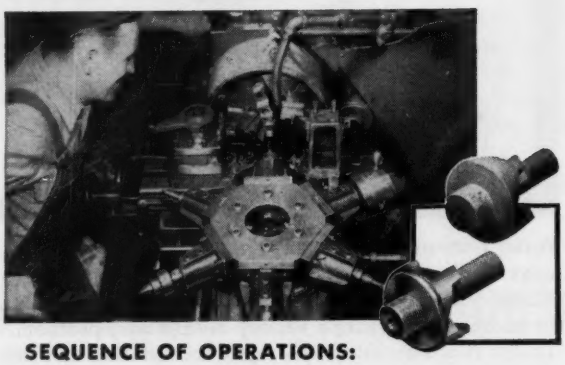
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

HERE'S HOW:



SEQUENCE OF OPERATIONS:

Note the star which indicates each time the Speed Selector is used.

★ **1. Hexagon turret—Center drill at 297 r.p.m. hand feed**

2. Hexagon turret—Support with live center

★ **3. Square turret—Rough turn and face at 96 r.p.m., .003 feed**

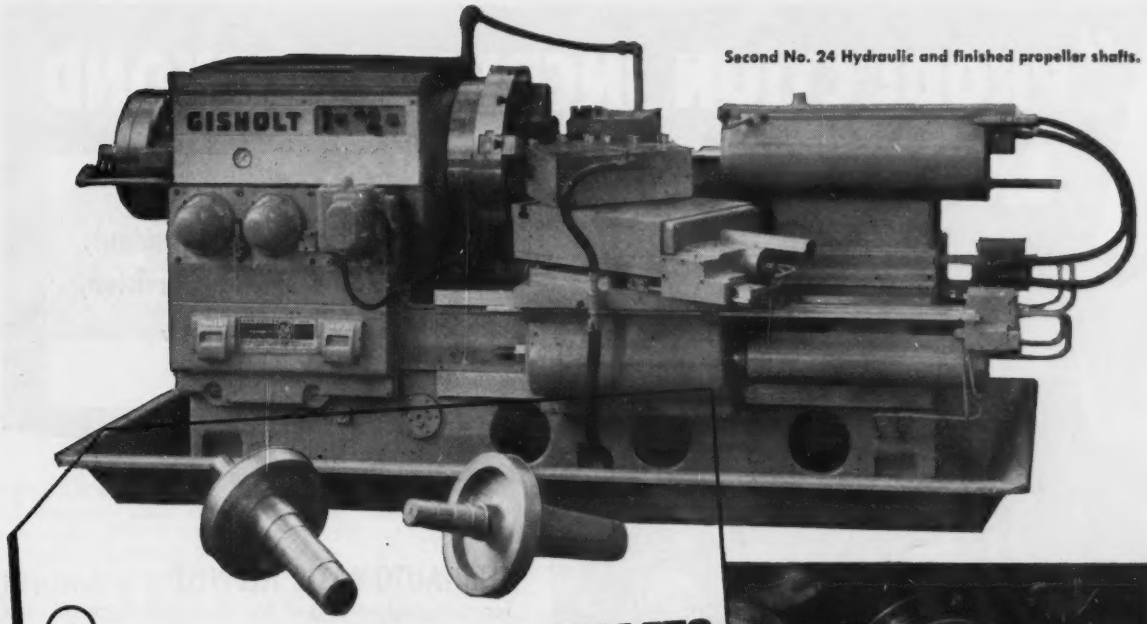
★ **4. Square turret—Finish turn, face and chamfer at 126 r.p.m. .002 feed**

★ **5. Hexagon turret—Start and drill through at 226 r.p.m., .003 feed. Trip the Hi-Lo lever, eliminating even the need for turning the hand wheel**

★ **6. Hexagon turret—Thread with tap at 39 r.p.m., leaders and followers**

—and you're ready for a new workpiece

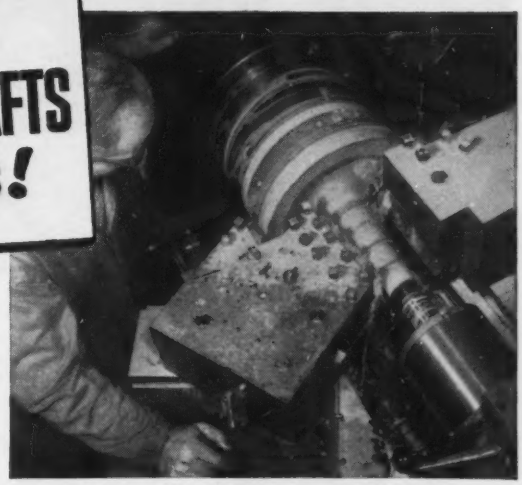
TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



Second No. 24 Hydraulic and finished propeller shafts.

AIRPLANE PROPELLER SHAFTS AT BARGAIN PRICES!

from GISHOLT No. 24 AUTOMATIC LATHES

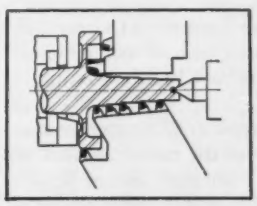


First No. 24 making chips on small end of shaft.

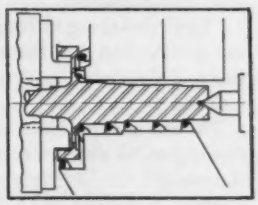
For speed and precision on these hefty drive gear and propeller shafts, production is divided between a pair of Gisholt No. 24 Hydraulic Automatic Lathes. The first machine gets the 275 lb. steel forging for nine different turning, chamfering, and facing operations on the 16″ gear blank and five-shaft diameters. 12 minutes later, the part moves to the second machine where nine tools perform similar work on the other side of the flange. Time again is 12 minutes.

Together, the two No. 24 Hydraulics remove a total of 75 lbs. of material. One man operates both machines. Another tough job handled to perfection by these high production machines.

The Gisholt No. 24 Hydraulic, like the famed smaller No. 12 combines ease of setup with exceptional speed and accuracy—all with fully automatic operation that means low costs on any job. If you have work up to 24″ diameter, you should have full details on the rugged, powerful, No. 24 Automatic.



Tool arrangement for first operation.



Tool arrangement for second operation.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

"PRODUCTION INCREASED BEYOND EXPECTATIONS"

—says
M. A. Enright, Vice President,
Nelson Stud Welding Division,
Gregory Industries, Inc.,
Lorain, Ohio.



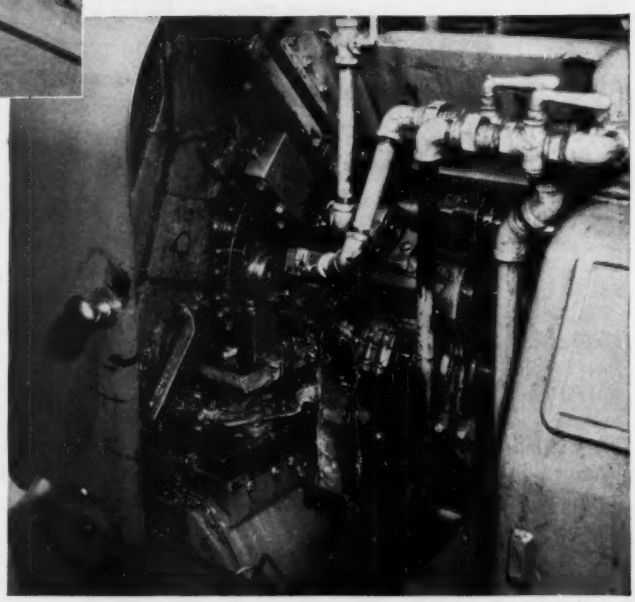
SEMI-AUTOMATIC NELWELD gun developed for controlled welding of flux-filled studs helps cut costs in every metal using field. Studs produced in many shapes and sizes are used to hang, hold and handle.

IN manufacturing studs for end welding," says Mr. Enright, "we have to choose materials for weldability and service, regardless of their machinability. This sometimes presents serious production problems. After testing a number of soluble and cutting oils over a period of years, we have found that *Texaco Transultex Cutting Oil,* recommended by Texaco Lubrication Engineers, reduces such problems to a minimum.

"Since changing to *Texaco Transultex Cutting Oil,* our production has increased beyond our expectations, and maintenance costs have been substantially reduced."

The above experience is typical. Whatever the machining to be done, whatever the machines used or the metal to be cut, there is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do it better, faster, and at lower cost.

A Texaco Lubrication Engineer will gladly give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



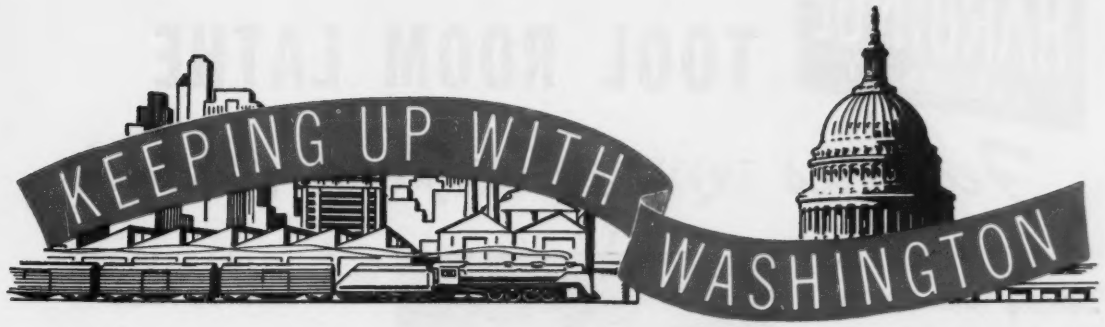
NELSON USES a battery of National Acme multiple spindle automatics, Brown & Sharpe single spindle automatics, and many Nelson Vertical single spindle automatics for threading and boring its end welding studs. Various kinds of stainless and 1015 to 1020 steels are used. Coolant is *Texaco Transultex Cutting Oil.* Machine lubricant is *Texaco Cleartex Oil.*

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television . . . Saturday nights, NBC.

For more information on products advertised, use Inquiry Card, page 243



By LORING F. OVERMAN

Types and Value of Machine Tools Shipped in 1953

THE Census Bureau reports that machine tools shipped by 407 companies in 1953 had a total value of $1,169,000,000, or 9 per cent more than the 1952 shipments valued at $1,077,000,000. Shipment of lathes, grinding and polishing machines, milling machines, boring machines, and drilling machines accounted for 86 per cent of the 1953 shipments.

There were 4650 boring machines valued at $163,600,000, an increase of 7 per cent compared with $152,300,000 for 4374 machines shipped in 1952. Forty-five per cent of the boring machines were vertical types.

Shipments of drilling machines were valued at $114,300,000 last year, 5 per cent above the $108,900,000 figure in 1952. Multiple-spindle drilling machines of way and special types accounted for 55 per cent of the total 1953 value.

Grinding and polishing machines, except equipment for finishing gear teeth, had a total value of $219,300,000 in 1953, there being 93,804 machines as against 1952 shipments of 89,146 machines valued at $210,100,000.

The 43,077 lathes shipped in 1953 were valued at $312,200,000, up 11 per cent from the $281,600,000 figure in 1952. The number of lathes amounted to $44,525 in 1952. Engine lathes, valued at $102,500,000 accounted for 33 per cent of the total 1953 value of lathes shipped.

The value of 17,525 milling machines shipped in 1953 was $196,100,000, a 23 per cent gain over the $159,300,000 value of the 16,252 milling machines shipped in 1952.

Shipments of 2546 gear-cutting and finishing machines in 1953 were valued at $44,900,000, down 5 per cent from $47,500,000 for 2725 machines in 1952. Gear shapers, cutters, and bevel-gear generating equipment represented 38 per cent of the total value of these machines in 1953.

Another Look at Defense

With Congress adjourned, the Washington spotlight has shifted from domestic to foreign affairs. And not a moment too soon, apparently, for startling changes in the world picture are being reported from both sides of the Iron Curtain. Unless there are some rapid face-abouts, it would seem that the Free World is losing its battle for men's minds. Strange as it may seem, there are untold millions of this world's citizens who do not see eye to eye with us, who are either uninformed about or unimpressed with the American way of life.

As a result, Washington is taking "another look" at our defenses. Such things as the "new look" and a "bigger bang for a buck" are not discussed any more. Instead, there is a new concept of defense which might develop into the idea of a Fortress North America. Previous defense plans, including those of World War II, were based on two ideas. The first was that the fighting, if any, would be done on the other side of the world. The second premise was that there would be plenty of time to organize and equip armies, navies, and air forces, before any great danger threatened our own shores.

Today, with allies none too enthusiastic about remaining on our side, Washington is giving serious consideration to the need for shoring up our own defenses—right here on the North American continent. With this new defense concept passing the talk stage, it can be forecast with considerable certainty that military budgets will not be less during the next few years. Instead, budget increases up to five or six billion dollars in the next two years are likely. Such authorizations will have a vital impact on the machinery and machine tool industries.

Sought immediately as an interim line of defense is a super air force, designed to keep the peace by convincing any potential attacker that bomber waves could not penetrate the defense screen. The ultimate weapon is being referred to as the I. B. M. — intercontinental ballistic missile with a hydrogen warhead. The first nation to develop this very possible weapon will be in a position to make all other ideas of defense or offense obsolete. The armament race ahead promises to be something to watch.

Washington Briefs

Census Funds Approved—One of those things which can happen only in Washington! Early in the session, the 83rd Congress authorized censuses of business, manufactures, and mineral industries. Then the House of Representatives refused to appropriate $8,400,000 for the work it had approved. During the closing hours of the session, members of the House had a change of heart—so funds are now available. The census of business will cover 2,700,000 retail, wholesale, and service establishments. Approximately 300,000 manufacturing plants will be covered in the census of manufacturers. Statistics to be gathered will help in appraising markets, supplies, consumer needs, and buying trends.

Renegotiation Act Extended—Authority to exempt machine tools and other production equipment from renegotiation proceedings is granted the Renegotiation Board in H.R. 6287, passed by the 83rd Congress. The legislation extends the Renegotiation Act until December 31, 1954, and increases to $500,000 the present $250,000 minimum amount of contracts subject to renegotiation.

Small Business Administration Active—The Small Business Administration had approved 649 loans to small business through August 13. The amount involved was $37,241,537, of which $26,562,702 were bank-participation loans, and the balance, $10,678,835, were direct loans.

Certificates of Necessity—The Office of Defense Mobilization has announced that 66 per cent of the value of Certificates of Necessity (to the amount of $19,200,000,000) have been issued for machinery and equipment manufacturing plants out of a total of $29,000,000,000.

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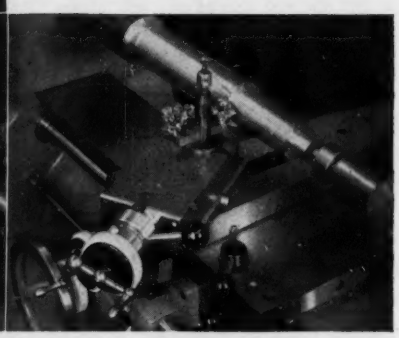
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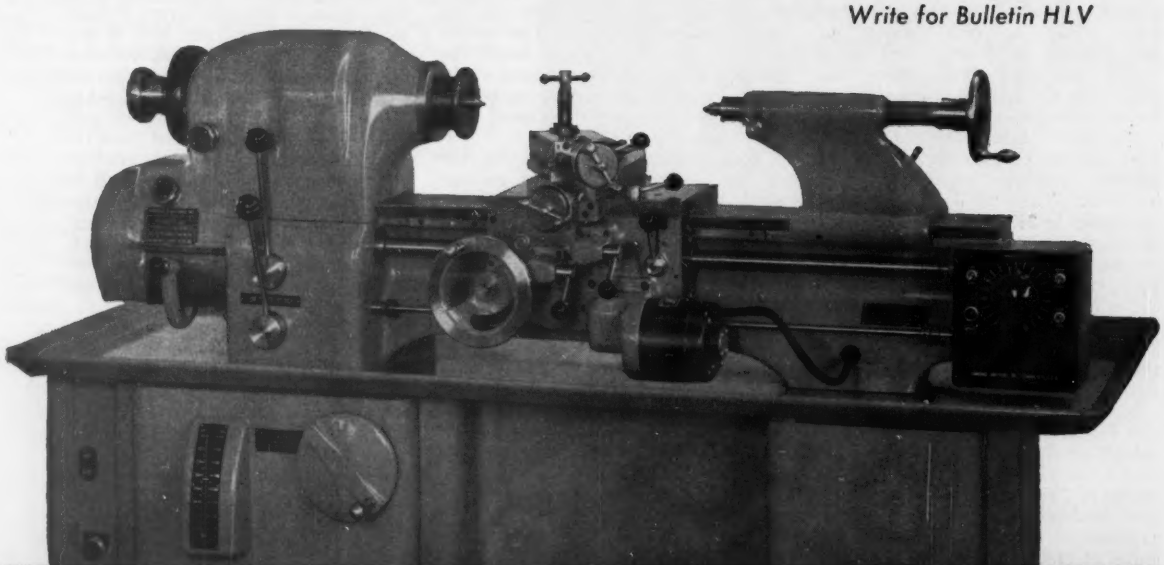


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MACHINERY
OCTOBER 1954

Accelerated Depreciation Finally Authorized

FOR many years the unrealistic rulings of the Internal Revenue branch of the United States Treasury Department with regard to the depreciation allowance for production equipment acted as a brake on the modernization of industry's manufacturing facilities. Financial executives of companies, large and small, were painfully aware of the long period of time required to recover capital invested in machine tools and other production machinery. The effect was a gradual deterioration in the efficiency of many industrial plants.

The vital importance of permitting faster depreciation of productive equipment was stressed by industrial leaders time and again before Congressional tax committees without avail until the present Congress came into being. The Internal Revenue Act of 1954, recently passed by this Congress and signed by the President, finally takes into consideration the *real* useful and profitable life of production equipment and gives the buyer a degree of option as to the rate of write-off.

The permitted degree of acceleration is less than had been advocated by the machine tool industry, and the options also lie in a limited range. Significant, however, is the fact that the optional principle has now been written into the nation's tax structure. The provisions of the new law offer substantial advantages.

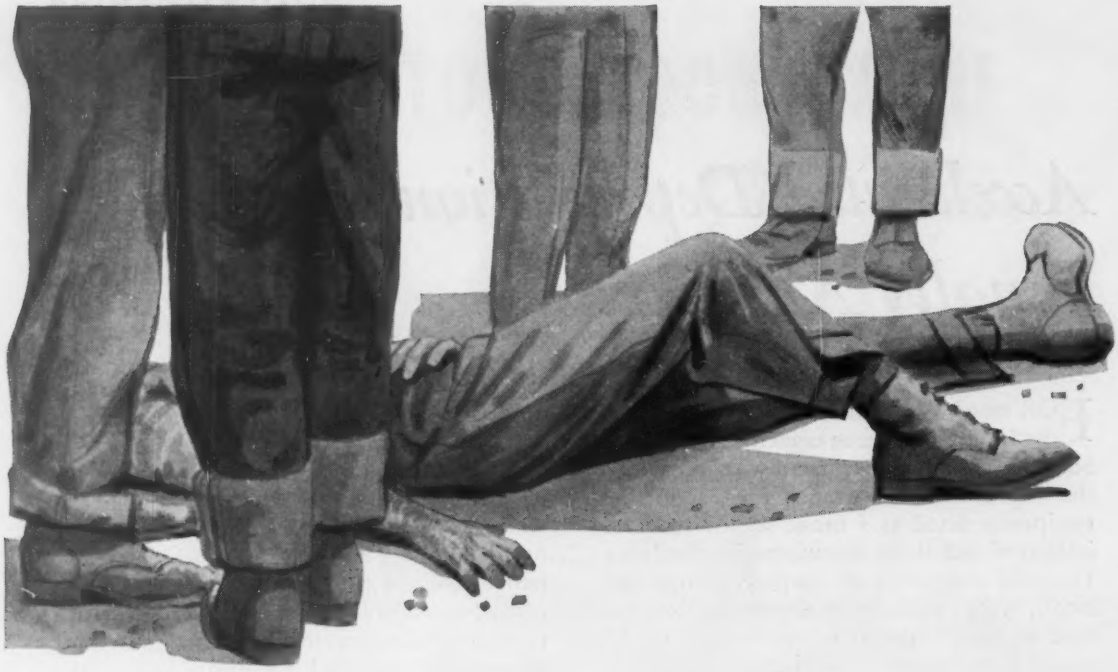
The chief optional provisions under which a concern may choose to write off machine tools at a faster rate than by the *straight-line method* (which may by choice still be used) are, according to an announcement of the National Machine Tool Builders' Association, as follows: (1) The *double-declining-balance method,* under which a company can write off approximately two-thirds of the original cost of the machine during the first half of the tax life of the machine. (2) The *sum-of-the-digits method,* under which a company can write off about three-fourths of the original cost during the first half of the tax life of the machine.

Under the straight-line method, the undepreciated balance at the end of ten years of a $10,000 machine which is to be wholly depreciated in twenty years would be $5000. Advantages of the two options are apparent when it is considered that the amount would be $3487 by the double-declining-balance method, and only $2619 by the sum-of-the-digits method. Details of the new tax law and the important advantages to the users of metal-working equipment are discussed in a comprehensive article prepared by a legal and financial authority, published in this number of MACHINERY.

The new depreciation provisions should prove an impetus to the sale of machine tools and other production equipment since they permit a more rapid recovery than heretofore of the invested capital. Financial executives can, accordingly, plan for earlier replacement of obsolete equipment. The sooner a used machine is disposed of and the higher the selling or trade-in price, the greater the tax saving. The longer a worn-out or obsolete machine remains on the shop floor, the smaller the saving in taxes.

Charles O. Herb

EDITOR



the "right" alloy steel that failed

A manufacturer wisely chose a certain alloy steel for key strength parts to avoid breakdown and the possibility of human injury. He specified an alloy that should have been right for the job. Yet, the "right" alloy failed. Why?

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All this extra quality protection is provided by Ryerson at no extra cost to you. So to be sure of your alloy steel—sure of type and quality, sure of what the steel will safely do—call Ryerson for *Certified* Alloy Steel.

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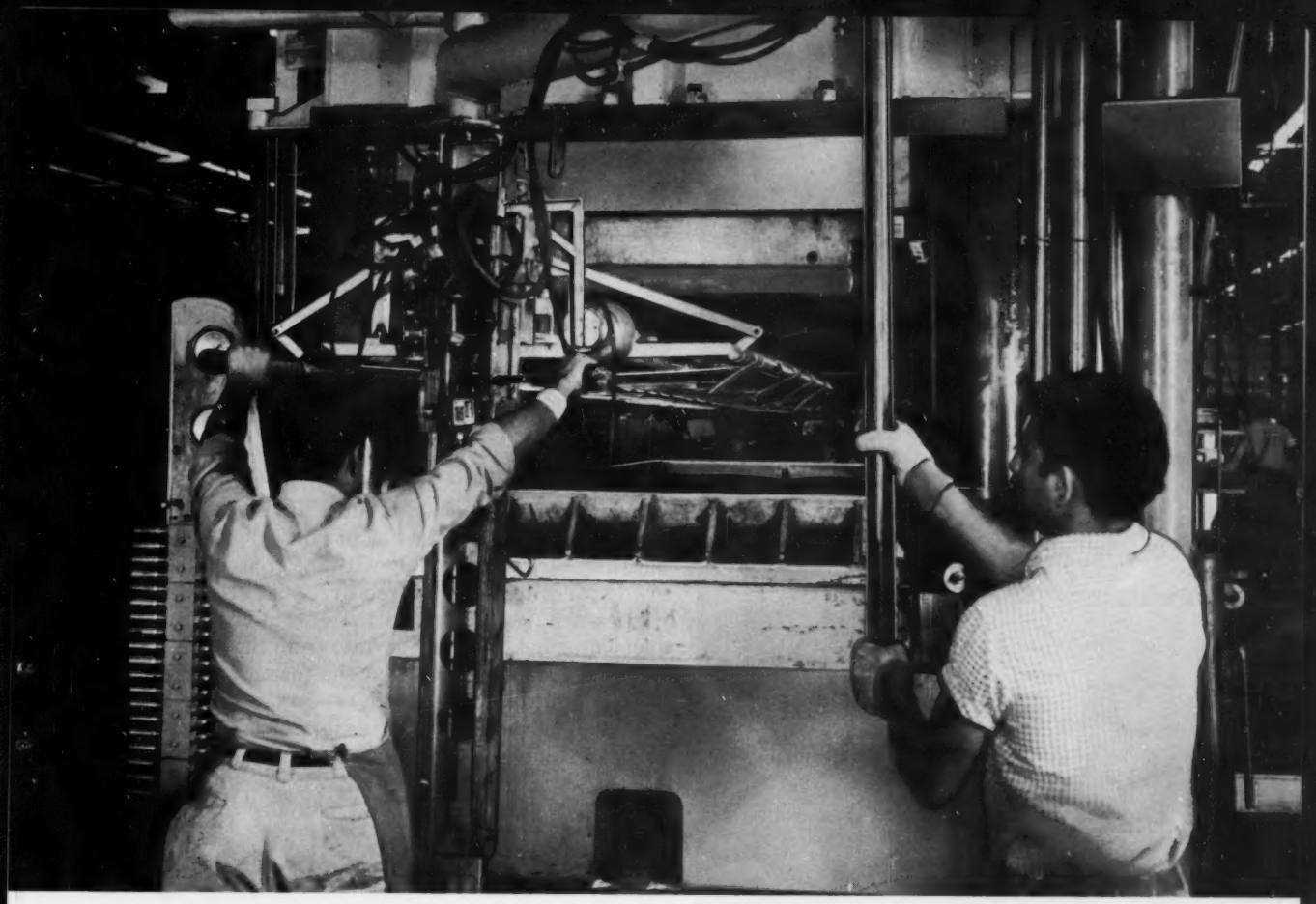
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FORM-DIE QUENCHING

Applied to Ribbed Aircraft Panels

A unique die that utilizes steel shot to provide a forming surface, enables the handling of parts non-uniform in cross-section

By JOSEPH S. CORRAL
General Foreman of Machine Forming
North American Aviation, Inc.
Los Angeles, Calif.

ALUMINUM sheets, plates, and grids of uniform cross-sectional thickness have for several years been successfully formed and cold-quenched in the forming dies by North American Aviation, Inc., Los Angeles, Calif. The technique employed was described in a comprehensive article published in July, 1952, MACHINERY.

This process has now also been applied to such components as skin panels for jet aircraft which consist of heavy plates machined to provide integral stiffener ribs and sculptured lands. Examples of such components are shown in Fig. 1. At the top is seen a leading edge skin before forming and, in the center, the same part after it has been formed and die quenched. The bottom

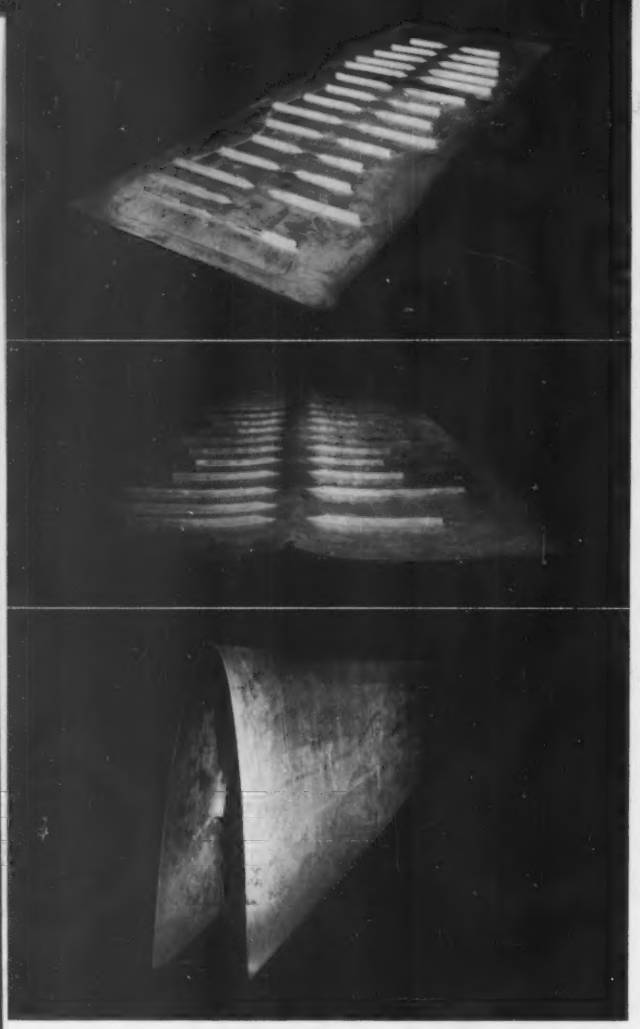


Fig. 1. Leading edge for a jet airplane before die forming and quenching, after die forming and quenching, and after finish-forming on a press brake

view shows the leading edge skin after it has been finish-formed on a press brake subsequent to the form-die quenching operation.

The practice of cold-quenching the work while it is held in the forming die was developed to eliminate the severe warpage and local buckling that are ordinarily induced when aluminum parts are water-quenched, due to nonuniform cooling of the metal. The amount of warpage and buckling vary considerably with the cross-section of the part. Recesses and relatively flat areas are particularly susceptible to the effects of water-quenching and they may deviate from the formed shape to such an extent that the forming operation is practically nullified. The correction of warpage in such parts is time-consuming and costly. Satisfactory results depend largely on the skill of the individual operator, whether the correction is performed by hand or under a power hammer.

The undesirable consequences of water-quenching are eliminated in form-die quenching because the process integrates the forming, heat-treating, and quenching into one continuous process. Components that are die-formed and quenched are produced with accurate contour

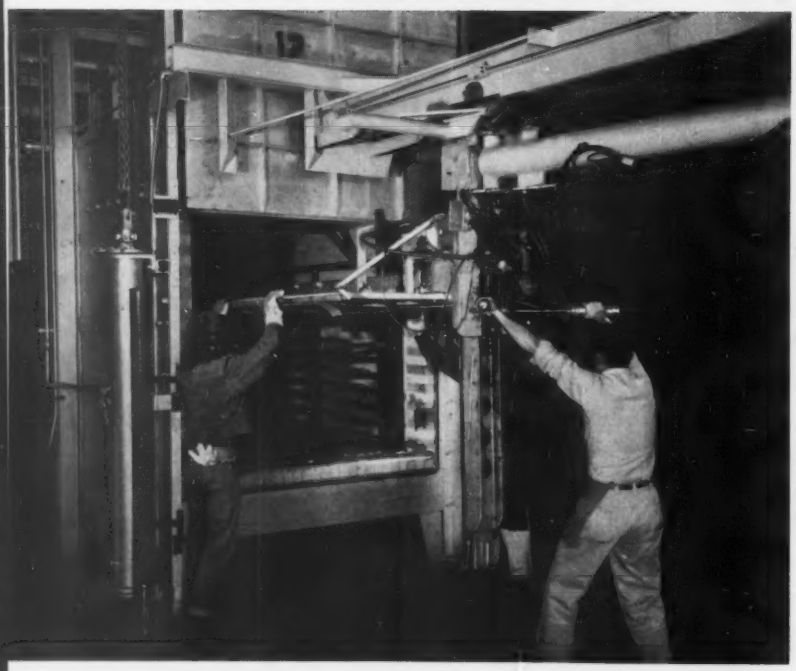


Fig. 2. Leading edge with integral ribs being removed from a furnace prior to placing under a hydraulic press for die forming and quenching

dimensions and free of warpage and residual stresses.

In the initial phase of the die-forming and quenching cycle, the part is placed in a furnace and heated to a specified closely controlled temperature. It is held at that temperature until complete and uniform heating of the metal has been achieved. The heated part is then removed from the furnace by means of a unique handling device, seen in the heading illustration and in Figs. 2 and 3, and quickly transferred to the lower member of a closely mated forming die anchored to the bedplate of a hydraulic press. The machine in Fig. 3 is an H-P-M Fastraverse press of 7000 tons rating, equipped with a hydraulic die cushion.

The upper die member, which is attached to the press ram, is then immediately brought down to simultaneously form and cool the part by metallic conduction of the heat through the relatively cold surfaces of the die. Because the die members constitute a large mass of metal, the die surfaces remain cool during a production run of parts made from thin-gage material. When heavy sections such as wing grids are die formed and quenched, however, it is generally desirable to cool the dies by circulating water through cored cavities beneath the die surfaces. A die set for this type of operation is shown diagrammatically in Fig. 4. The water is discharged into a sump and pumped to a cooling tower for further use. Loss of water is avoided by shutting off water pressure and purging dies with air under pressure for approximately one minute before the dies are opened.

Residual stresses and spring-back are entirely eliminated from die formed and quenched components because the metal expands uniformly in all directions as the natural consequence of the elevated temperature. Permanent stretch or deformation of the metal is achieved by subjecting the expanded metal to a high forming pressure and maintaining this pressure through the cooling period. Thus, contraction of the metal during cooling is prevented. The percentage of stretch introduced in the metal in die forming and quenching is, of course, proportional to the coefficient of thermal expansion of the aluminum alloy at the processing temperature.

Modifications of Form-Die Quenching for Handling Integral-Ribbed Panels

Modifications in the die forming and quenching process were found necessary when the attempt was made to apply the process to skin panels with integral ribs and sculptured areas because it would not be feasible to use matched

Fig. 3. Swinging a leading edge with integral ribs from the furnace to a hydraulic press equipped with a shot type lower die member



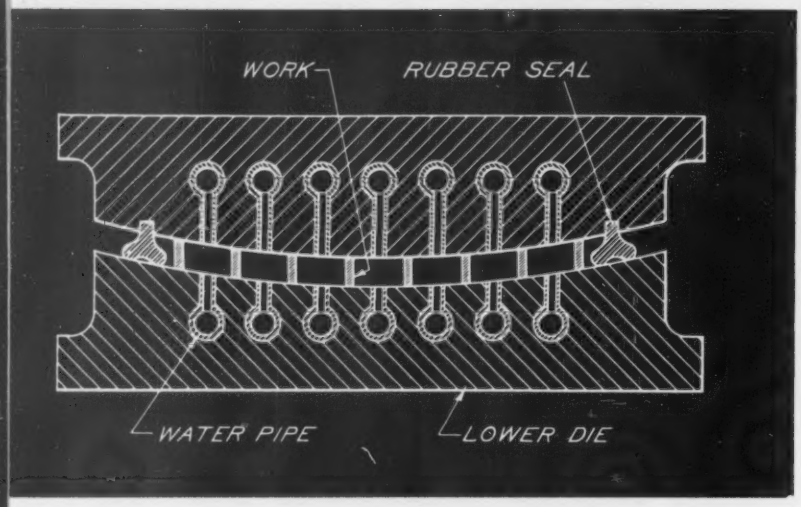
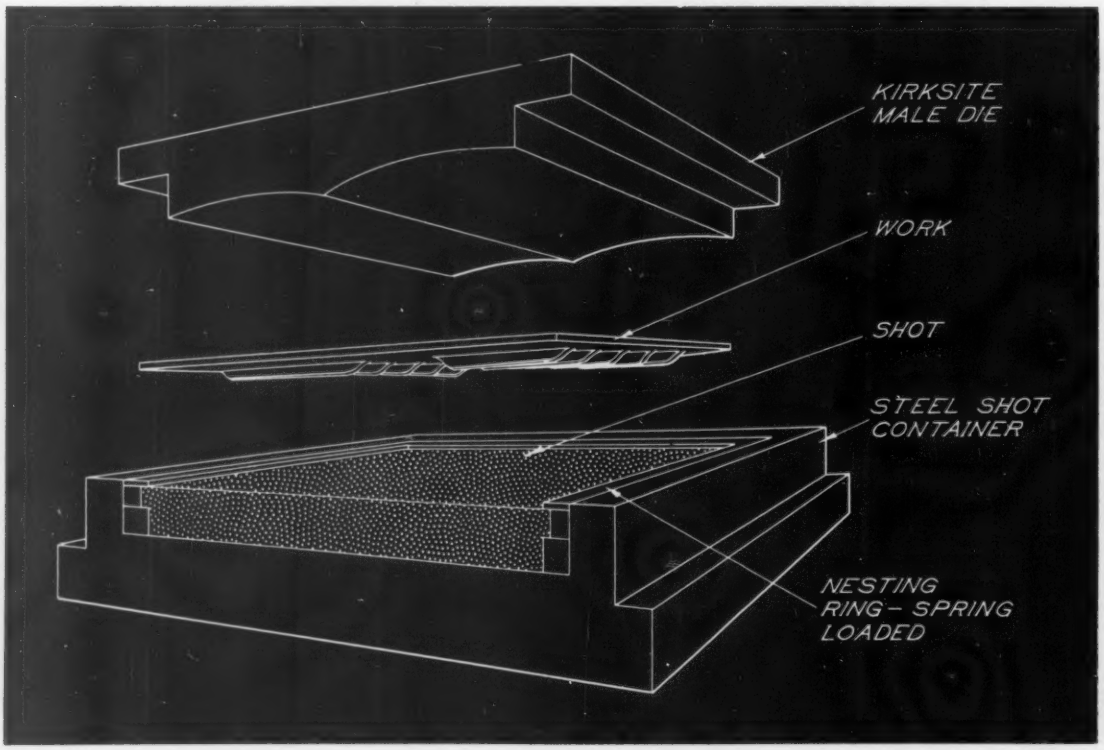


Fig. 4. Diagram of a die set employed for wing grids, both upper and lower members being constructed to permit circulation of water for cooling purposes

dies for such components due to the numerous thin-section ribs. A solution was reached by providing, instead of a matched member, a large bottom die that consists primarily of an open box-like rectangular steel weldment. This hollow die member is filled with 0.027-inch steel shot to a depth of 6 inches, as shown in Fig. 5.

Prior to an operation, the shot is carefully leveled into a horizontal plane. Then the work is placed on top of the shot with the ribs and other contoured surfaces downward. When the hydraulic press ram pushes the top die member on top of the work, the ribs and other contoured surfaces on the under side of the work are forced

Fig. 5. Drawing that illustrates the details of the die set in which metallic shot is provided in the lower member to accommodate the ribs and various contours on the one side of integrated skin panels



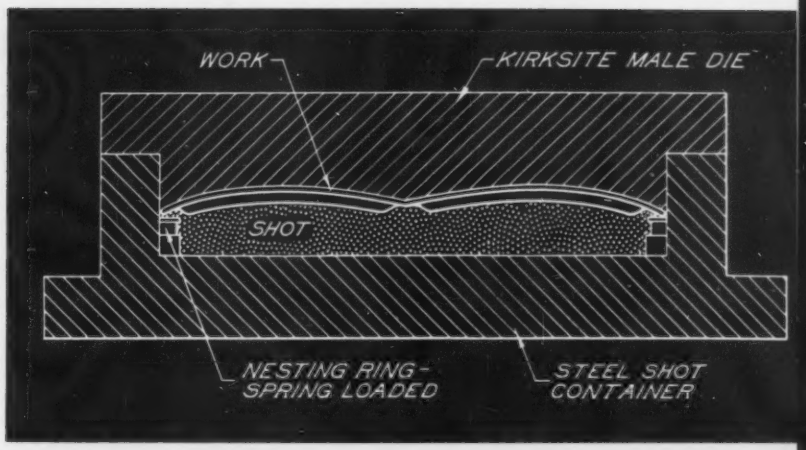


Fig. 6. Diagram indicating the manner in which the metallic shot is displaced in the die used for forming and quenching of skin panels having integral ribs

downward into the shot, causing the shot to spread apart so as to receive the ribs and other contoured surfaces. The shot flows into all cavities of the work until it has become compressed into a solid mass, as shown diagrammatically in Fig. 6. One hundred per cent contact of the shot with all bottom surfaces of the work-piece is effected. This complete contact promotes fast cooling and insures that the component will not contract while cooling.

A leading edge with integral ribs on the under side is seen lying on the shot bed in Fig. 7. The appearance of the shot after this leading edge was removed from the die is seen in Fig. 8. Not only can the effects of the contour of the under side of the leading edge be observed, but also the narrow slots left in the shot by the ribs.

Simplicity of tooling is a feature of the shot type lower die member. It can be used for a large variety of work-pieces in which a separate die would be required for each different piece of work if the bottom die had to be made with solid surfaces to match those of the work. The shot container, or lower die member, is provided with a steel nesting around the outer shot cavity, as illustrated in Fig. 5, so as to prevent the shot from escaping during the application of pressure. The upper die member is a Kirksite casting as in conventional practice. An upper die member must obviously be made to suit each different piece of work. It has not been found necessary to circulate water around the walls of the shot type bottom die.

The length of time that a skin panel remains in the Lindberg electric furnace (seen in Fig. 2) prior to the forming and quenching operation,



Fig. 7. The end of an operation in which a leading edge with integral ribs was formed and quenched while held on a bed of steel shot by the upper die member

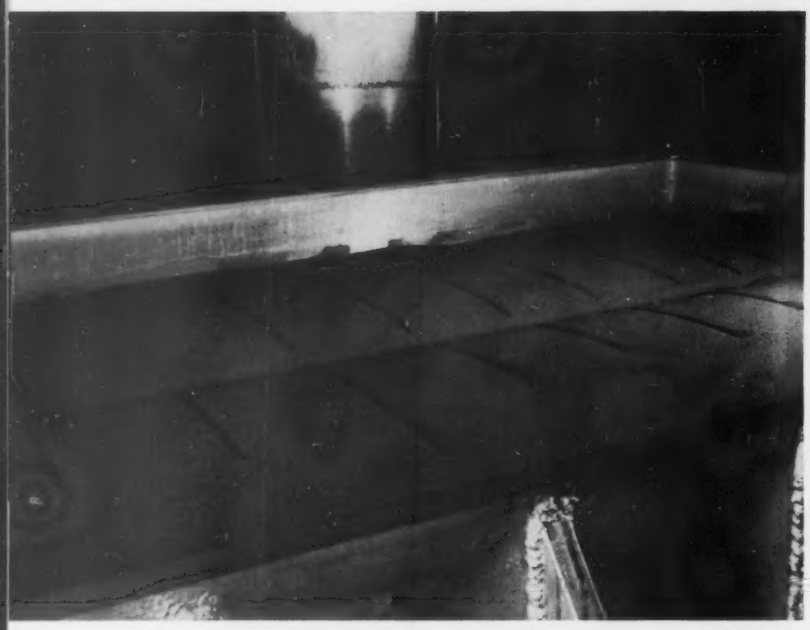
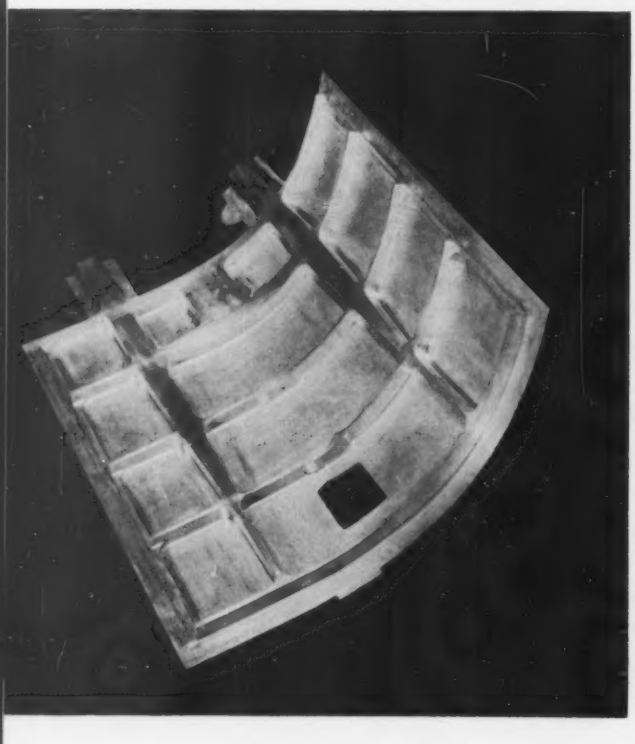


Fig. 8. The manner in which the steel shot was displaced by the contours and ribs of the leading edge in Fig. 7, can be here clearly seen

and the temperature to which the component must be heated, depend somewhat on the size and contour of the part and also on the material. Most integrated structural members are made from 75S aluminum on account of its high strength in the heat-treated artificially aged condition. When the skin panel is removed from the furnace, it must be placed on the shot bed with a minimum lapse of time, since the transferal time from the furnace to the press is extremely critical. If the dies cannot be closed within thirty seconds from the time the part has been taken from the furnace, it is returned to the furnace for reheating. Fast transferal has been made possible by the special handling device and through the provision of index-pins on the bottom die with which holes in the work-piece are registered. The heavy forming pressure is usually maintained for about two minutes.



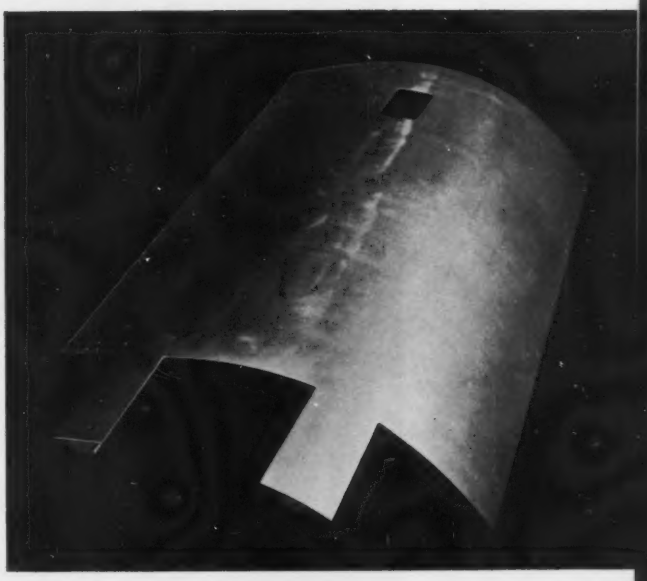
Fluid Back-Up Pressure Applied in Form-Die Quenching Parts with Deep Curvatures

Integrally stiffened panels to which a deep curvature must be imparted, as in the case of the door shown in Figs. 9 and 10, are beyond the capacity of the shot process in its present stage of development. This door is machined from a flat 75S aluminum-alloy plate to a thickness of 3/4 inch in the heavy section and to a minimum thickness of 0.04 inch in the skin areas. This door is die formed and quenched by a method that involves the application of oil under a high pressure to support and simultaneously quench the thin portions of the part. Both the upper and lower dies are cast from Kirksite and mated to provide close contact along the heavy sections.

The lower die member is made with a network of high-pressure tubing that is manifolded to

Fig. 9. A compound curved door which has such a deep curvature that it cannot be formed and quenched over steel shot

Fig. 10. The outer side of the door in Fig. 9 is similar in appearance to the door here shown



deliver the fluid to the cavities on the under side of the part, as indicated diagrammatically in Fig. 11. This portion of the die assembly is also fitted with under-size filler pads for the purpose of reducing the volume of fluid required to fill the recessed areas of the work-piece.

The fluid is trapped by a full thickness land machined on the outer periphery of the flat blank. The land is forced into the lower die member by the press ram. The land is later removed in the finish-trimming operation. After the forming cycle is completed, the fluid is released by opening a valve on the return line of the hydraulic unit, flowing by gravity to the hydraulic unit reservoir.

Preparatory to die forming and quenching, the part is preformed at a specific temperature in order to prevent failure of the metal in the thinner sections. After preforming, the part is reheated for the die forming and quenching.

In order to meet physical property specifications and to achieve close adherence to the prescribed contours, three important conditions must be met. The heating temperature prior to die forming and quenching must be controlled within a very few degrees, the transfer time interval between the removal of the part from the furnace and the closing of the die members must be held to the absolute minimum, and not only the forming pressures but the rate of application must be uniform.

The hydraulic presses used for die forming and quenching were designed not only to suit current practice but to anticipate future developments in the process. The largest machine used for this work is the H-P-M 7000-ton press on which the impact pressures are selectively controllable. This press is of the open rod type with a hollow pedestal type bed. The bed is fitted with a 6300-ton hydraulic die cushion and has a bolster plate that measures 144 inches in length by 72 inches in width by 30 inches in thickness.

Another unique feature of the press is a provision for introducing a second upward acting force which provides a means of bulging parts that have been previously formed by the downward movement of the press ram. In such operations, the main ram functions as a clamp on the formed work-piece, being held in position by pressure generated in the accumulator, while radial pumps supply pressure to the die-cushion ram to provide an upward acting force.

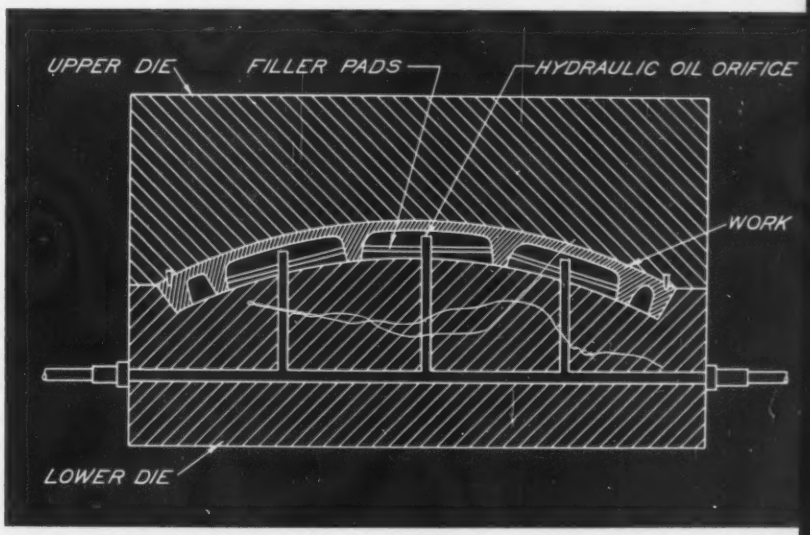
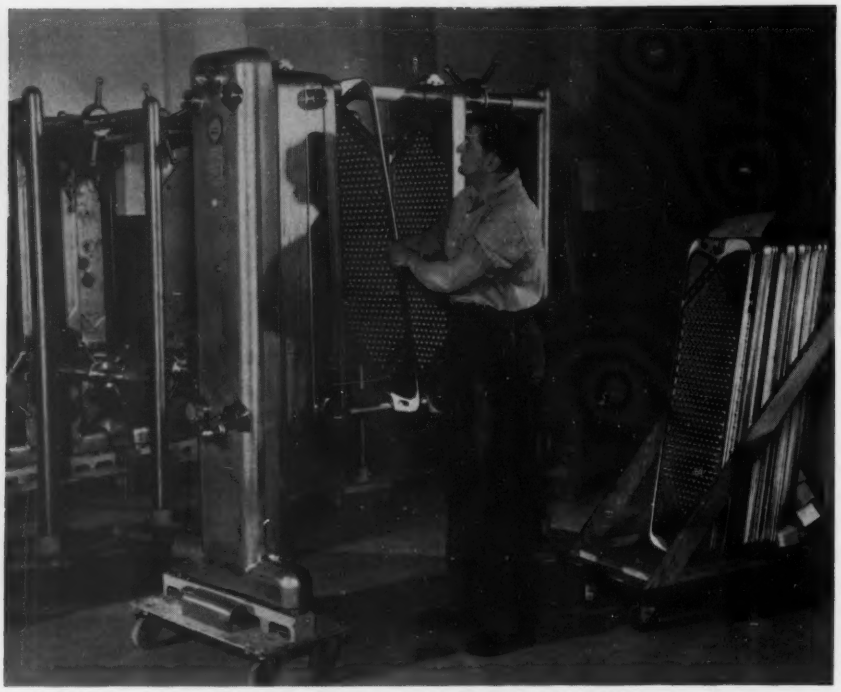


Fig. 11. Schematic drawing of a forming and quenching die arranged for the delivery of fluid under a high pressure to form and quench parts having a deep curvature



Cleaning and Polishing Heat-Exchanger Parts

Knob-surfaced plates of stainless steel form the heart of sanitary heat exchangers for use in food processing equipment. Over 100 individual plates are produced from one basic stamping. A unique electropolishing treatment provides a smooth, satin finish for high heat-transfer efficiency

By Raymond H. Spiotta
Assistant Editor

A STRIKING example of what can be accomplished when product design and production know-how complement each other is presented in the "Superplate," a sanitary heat exchanger manufactured at the Little Falls, N. Y., plant of the Cherry-Burrell Corporation. This heat exchanger is used for heating, cooling, and regenerating (as in the quick pasteurization of milk). The main part of the unit is a group of stampings made from AISI Type 304 stainless steel.

The stampings for various designs of heat exchangers have the same major dimensions, but locations of gaskets and ports vary considerably. Careful analysis of the manufacturing procedure made it possible to obtain more than 100 different plate designs from one basic stamping. Several of these stampings are shown in the heading illustration being assembled into a typical heat exchanger.

Three dies are employed to produce the basic stamping, this work being done in the shops of the Bossert Corporation, Utica, N. Y. First, the 0.043-inch thick plate is blanked out, complete with required notches at both ends, on a 400-ton mechanical press. Next, a forming and embossing die in a 1200-ton Toledo knuckle press forms the gasket grooves, turns up the edges around the periphery, and embosses a large number of hemispherical "dimples." The flanges around the

notches are curled under in a small toggle press, using a third die. In this operation, one end of the plate is placed in the die and the press actuated. Then the plate is reversed and the opposite end inserted for curling.

An interesting feature of the forming and embossing die is the manner in which the individual embossing punches are constructed. The basic dimensions of each finished dimple are a diameter of 13/16 inch and a depth of 0.230 inch, but a certain amount of tool wear is inevitable due to the large quantities of plates needed. The cost of reworking all 361 embossing punches in a die of this size would be extremely high. To minimize the expense entailed in die maintenance, each punch is removable. It consists of a hardened steel ball held securely in place in the punch-holder, yet easily replaceable. When the wear on any particular embossing punch exceeds the limit of acceptability, the ball may be readily replaced.

Located in each of the four corners of the plate, completely bordered by gasket grooves, are blocked-off ports. All plates are received from the punch press this way. Based on the final desired functions of the heat exchanger, the engineering department must decide which port, or group of ports, must be punched, or even if all the ports are to remain completely blocked. This selective punching operation imparts to the stampings the first characteristics of individual, non-interchangeable parts.

Powerful, lightweight, portable electric tools are used extensively for grinding, polishing, and buffing the various components of the heat exchanger. Burrs and knife edges are shown being removed from the flanges of the plates in Fig. 1. This operation is important because it prevents digging-in of the plates and subsequent marring of the guide rail on which the plates are supported, and along which they must frequently be moved during normal usage. Also, by removing the sharp edges, the danger of personal injury is obviated. "Hicycle" portable tools operating on 180-cycle, 220-volt, three-phase current are extensively used in this plant. Manufactured by the Chicago Pneumatic Tool Co., they are powered by General Electric 25-K.V.A., 180-cycle, motor-generator sets.

A smooth, satin finish that maintains a high heat-transfer efficiency is obtained through a unique electropolishing operation. It is really an electroplating process in reverse, as the part to be polished becomes an anode rather than a cathode. Prior to this treatment, the plates are thoroughly cleaned to remove all dirt, oil, and any other foreign material that might contaminate the polishing bath. They are immersed for ten to twenty minutes in a tank containing a caustic solution which is held at a temperature of 210 degrees F.

An electropolishing tank is shown in Fig. 2. Each plate is supported in three places by a single conductive clamp assembly. The loaded clamp is lowered into the electrolyte by hand and suspended on round bus-bars extending the length of the tank. DuPont glycolic sulphuric acid bath serves as the electrolyte.

A current of 1000 amperes at 12 volts, for every three plates, flows from the positive bus-bar on which the clamps are hung, to negative copper plates surrounding the work-pieces. The timing of the treatment is semi-automatic in that it is turned on by hand but shuts itself off after six minutes. A temperature of 180 degrees F. is maintained in the bath by means of water-filled cooling coils in the tank. This is immediately followed by a hot-water rinse, a phosphoric acid rinse, and a second hot-water rinse.

During the polishing cycle, a thin surface layer of the plate flows into the electrolyte and



Fig. 1. Sharp edges and jagged burrs are removed from formed flanges with portable electric grinder.

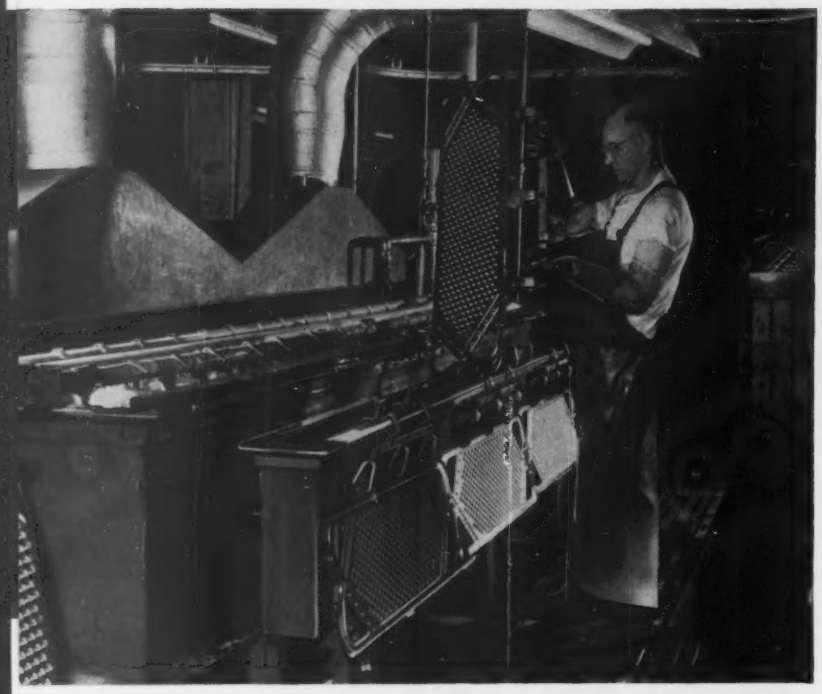


Fig. 2. During an electropolishing operation, each plate is held in a three-point conductive clamp assembly and suspended in a tank of electrolyte. A current of 1000 amperes at 12 volts is fed through each three plates.

precipitates. This material settles to the bottom of the tank in the form of sludge. Due to this action, the basic chemical balance of the bath is preserved over an indefinite period, requiring only the infrequent addition of a booster solution. At approximately two-month intervals, the sludge is plated out of the tank by replacing the work-pieces and copper plates with stainless-steel plates. The current is turned on for about four hours, during which time the sediment plates onto the steel terminals.

An example of the luster that can be obtained by this method of surface finishing is illustrated comparatively in Fig. 3. The right-hand plate is before electropolishing and the left-hand plate after. This treatment affects all the surfaces, whether hidden or not. This is, however, a slight disadvantage since any cracks or pits will be eaten away equally on all sides, thus aggravating them.

Final differentiation between stampings in which the various ports, or group of ports, have been punched, is attained through gasketing. In this operation, each plate assumes individual features which enable it to be catalogued as a separate and distinct part number.

A "Supertite" rubber bonding cement is applied to the required gasket grooves so that it overlaps the edges. The cement is also applied to the bottom surface of preformed gaskets. When the bonding agent has become tacky, the gaskets are installed and the plates stacked in a fixture

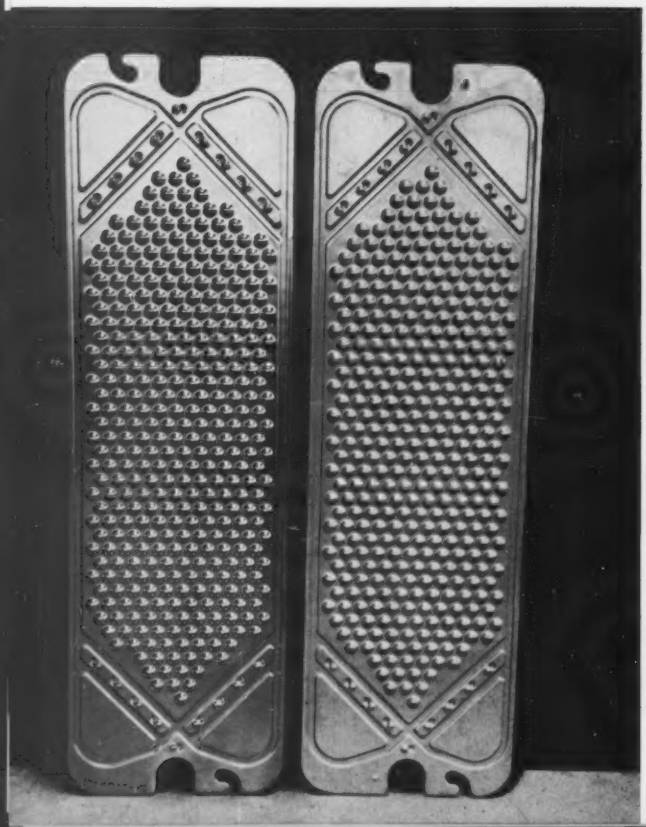


Fig. 3. A typical example of the results of electropolishing is the plate on the left-hand side. The plate on the right-hand side typifies the condition of the parts prior to the treatment.

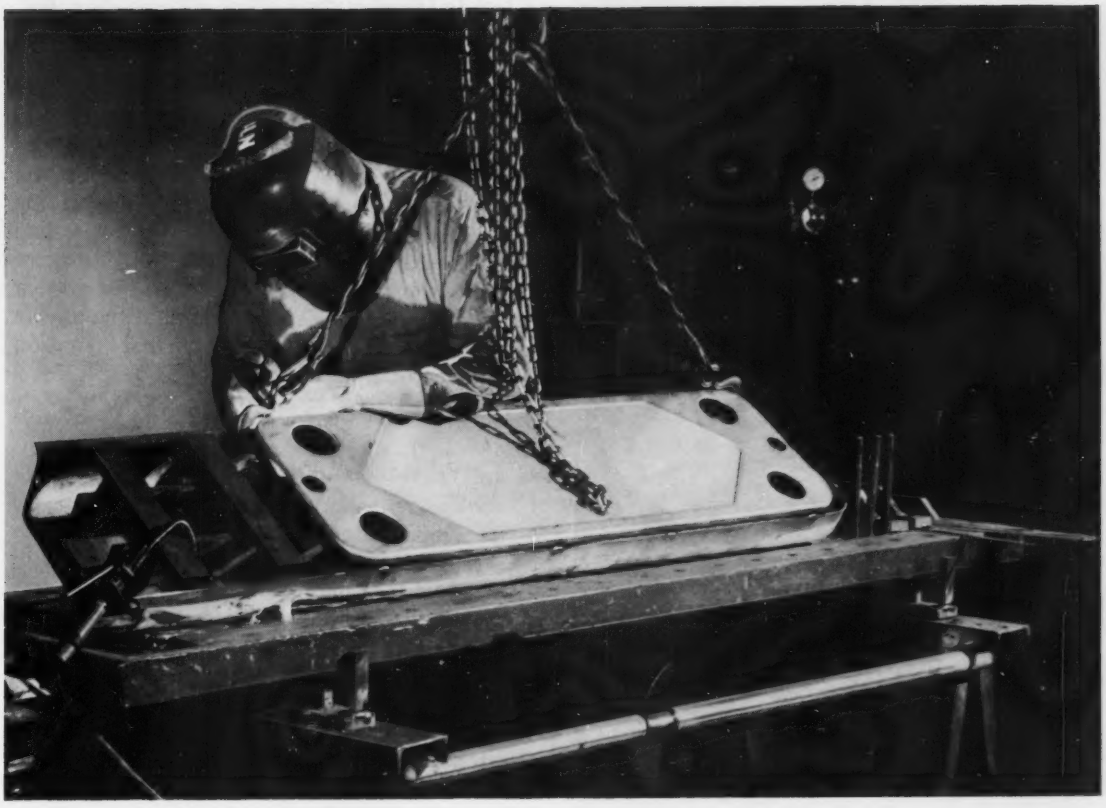


Fig. 4. Hot-rolled steel frame is inert-gas, tungsten arc-welded within a deep-drawn, stainless-steel shroud. Argon gas is used as a shield.

under pressure. The fixture is placed in a curing oven until the plate and gasket are firmly sealed.

After curing, all excess rubber bonding cement is removed and the joints are carefully inspected. If any imperfections are revealed, the seal must be removed, the plate cleaned, and a new gasket installed and cured. It is important that no cavities or pockets be present in the gasket joint as they will catch and retain whatever substance is circulated through the unit.

Three main members of the press section of the Superplate remain to be fabricated. They are known as the fixed end, terminal, and follower block, and may be seen in the center of the heading illustration.

Construction methods employed on all three members are about the same and therefore may be considered together. The core of each of these



Fig. 5. Internal grinding wheel used on a portable electric tool simplifies burring of welded fitting bore. All sharp corners must be removed from surfaces that are to contact the liquid flow.



Fig. 6. Offset Hicycle polishing tool is used to clean up welded seams on the side of this terminal member.

parts consists of 3/8-inch thick hot-rolled steel sections that are metallic-arc welded together to form a frame-like assembly. This assembly is then lowered into a deep-drawn stainless-steel shroud and welded as shown in Fig. 4. Hand-held, tungsten electrode, inert-gas arc-welding guns are used. Filler rod is fed into the molten area through an envelope of low-velocity argon gas. This type of welding does not require the use of a chemical flux, and the weld produced necessitates a minimum of finishing. The gun is powered by a General Electric motor-generator unit.

Following this, all necessary fittings are welded in place and cleaned. The bores of the fittings on a fixed end are shown in Fig. 5 being ground and polished. All rough surfaces, indentations, and sharp corners must be removed to meet the sanitary requirements imposed on the finished product. An offset Hicycle power tool equipped with a rubber-backed polishing disc is used for smoothing and polishing the weldment on the side of an almost completed terminal, Fig. 6.

Plates are assembled by placing each one in a predetermined order so that a proper liquid flow within the heat exchanger is assured. The terminal and follower block are suspended from a guide rail by means of V-shaped rollers for ease of assembly and disassembly. When all components are in place, the press is locked up and tested under actual operating conditions. If the unit performs satisfactorily, each plate is then stamped with a number running in consecutive order from one end to the other. In this way, a mix-up of the plates is avoided when the unit is dismantled for cleaning during normal operation at its place of final installation.

* * *

"Vibratron" Facilitates Location of Vibrations

The Timken Roller Bearing Co. is using an instrument called the "Vibratron" which will locate abnormal vibrations in rotating parts without the necessity of dismantling the machine. It is making the job of maintaining extremely close accuracies in Timken roller bearings a simpler and easier task. The portable instrument consists of a vibration pick-up, a filtering probe, a stroboscopic lamp, and an electronic instrument that records frequency and amplitude of vibration. Out-of-balance parts can now be detected while the machine is operating. By using the "Vibratron" in its maintenance program, the company has been able to maintain an average vibration level on its grinding machines to 0.000090 inch.

With the pick-up probe in position, the various parts of the machine are started, one at a time, and the amplitude reading observed after each successive step. This indicates which parts of the machine give the most vibration. The part is double-checked with the light which is triggered by the strongest vibration felt by the pick-up probe. From this point on, it is simply a matter of balancing the part by replacement or repair until the reading approaches as nearly as possible the reading taken with the machine off.

* * *

A short drill will produce more holes per sharpening than a longer drill of the same diameter, everything else being equal. The reason is that the shorter drill is more rigid than the longer one and therefore is less subject to chatter, bending, and "wind-up." The increase in the number of holes produced is often far greater percentage-wise than the difference in over-all lengths of the drills—*Metal Cuttings*, published by the National Twist Drill & Tool Co.

Aluminum Screw Machine Work is Big Business at Kodak

By NEALE J. HAMMOND
Aluminum Company of America
Rochester, N. Y.

AUTOMATIC screw machine operations are of considerable importance in Eastman Kodak's Camera Works because the screw machine department produces—from virtually every material that can be turned—large quantities of many different parts for about 300 photographic products. The Camera Works is one of five Eastman Kodak units in Rochester, N. Y., four of which are manufacturing plants. It occupies eight multiple-story buildings where 2,500,000 parts are produced daily on 3500 machines. The entire output is carefully controlled, one out of every seven production employes being an inspector.

The products cover five general classes: cameras, projectors, professional apparatus, photographic accessories, and government contract work. Approximately 270 of the products are in the accessory group and include printers, enlargers, flash-bulb holders, carrying cases, splicers, and film viewers.

The automatic screw machine department is essential to the over-all operation. With the exception of camera cases (primarily made from leather or fabric and wood), parts produced in this department go into almost every product manufactured. Aluminum screw machine parts are used in virtually all cameras, projectors, and a great number of accessories; and play a vital part in production under government contract. Typical are the aluminum screw machine parts shown in Fig. 1 in front of the three still and motion picture cameras in which they are used.

The 265 screw machines in the department are high-speed automatics, used interchangeably for all materials. The greatest consumption of screw machine stock is in brass, aluminum, and steel, the proportion being about 50 per cent brass, 30 per cent aluminum, and 20 per cent steel. In terms of the quantity of parts produced, nickel-silver should also be included as an important screw machine material, as it is used ex-

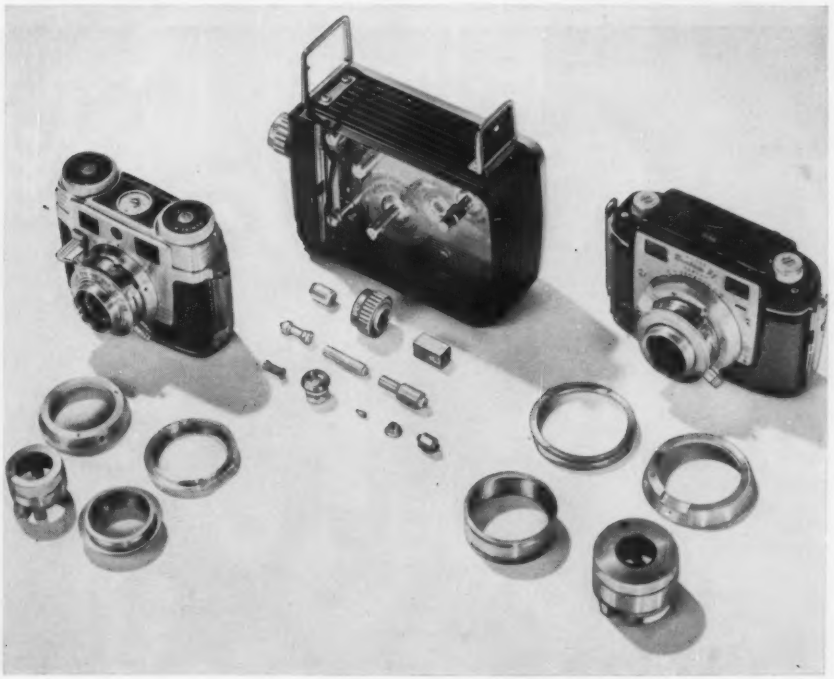


Fig. 1. Typical aluminum screw machine parts are shown in front of three still and motion picture cameras in which they are used.

clusively for camera shutter parts because of its anti-gumming properties. Although a month's production of nickel-silver would only fill a small container (because of the extremely small unit size), this material is both extremely critical and important in the large number of parts produced. Other materials machined include bronze, copper, drill rod, Tenite, phenolic, and nylon. Special requirements dictate the use of such materials: for example, phenolic is used to produce film rollers because it is dry lubricated, turns freely, and needs no finishing.

Although the aluminum used in the screw machine department represents about 30 per cent of the total material by volume, it is less than 15 per cent of the metal consumed by weight. Aluminum used consists of rod and bar stock, ranging from 1/8 inch to 2 1/2 inches in diameter. The greater portion of this is Alcoa 11S-T3, a free-cutting aluminum alloy containing about 5 1/2 per cent copper. About 10 per cent of the production is Alcoa 17S-T4 aluminum alloy, containing approximately 4 per cent copper, 0.7 per cent manganese, and 0.15 per cent magnesium. The principal parts machined directly from aluminum stock include several types of fasteners, lens mounts, bushings, rings, and focussing cams, In addition to screw machine stock, the department machines some partially formed items such as press-formed blanks and impact extrusions.

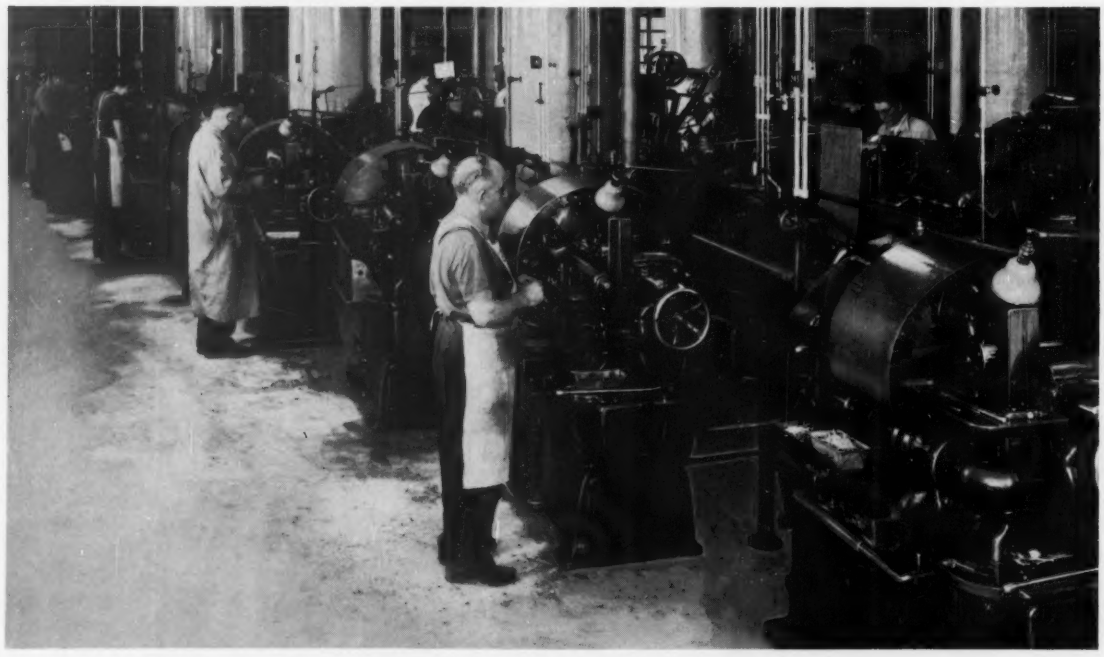
Basic processing instructions come from the production engineering group. All units required for production are broken down into parts, and each part, as well as each operation for its production, is individually scheduled. Every operation, tool, and machine is individually detailed in the screw machine department, in conjunction with records and schedules established by the production control departments.

A normal part of the design engineering work is consultation with the production units that will perform operations on any given part. This is especially true with screw machine operations, about which the production engineering group generally confers with the shop on machining methods and tools prior to scheduling. The choice of material is a prime responsibility of the design engineering department. Suitability of material and cost are the major factors involved in most decisions.

Operation of the Automatic Screw Machine Department

Consistent with basic specifications and assigned production schedules, the department attempts to run each individual job as efficiently as possible and under closely controlled conditions. The shop itself is laid out with all services at the center of the room. Machines are located at either end, with the units of smaller capacity (Brown & Sharpe Model OOG

Fig. 2. A few of the 265 high-speed, automatic screw machines employed at Eastman Kodak for producing parts of cameras, projectors, and accessories



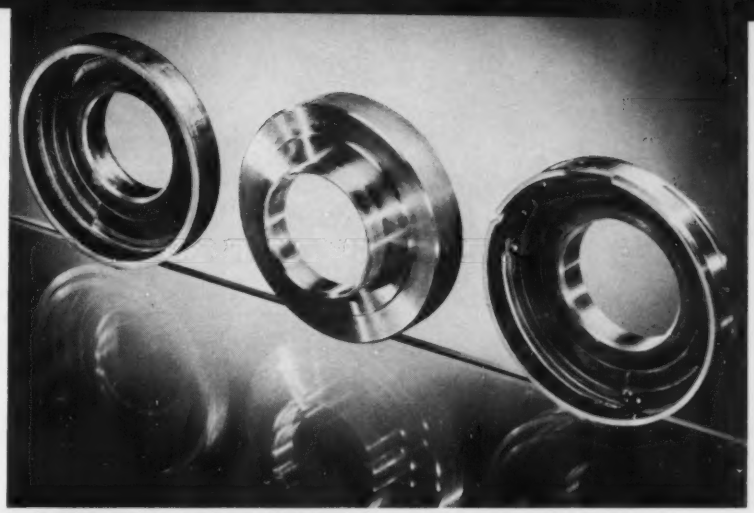


Fig. 3. (Right) Progressive steps in producing aluminum shutter case: (left) after blanking and drawing; (center) after first screw machine operations; and (right) after final machining



Fig. 4. (Left) Fuse bodies are produced from aluminum impact extrusions such as the one at left. Machining is completed on two automatic chucking machines of six-spindle type

and Davenport machines) in one section, and larger machines, Fig. 2, in the other. The central service areas include raw materials storage, parts stock-room, tool-crib, timekeeping, dispatching, tool and operation lay-outs, sharpening, washing, and parts inspection, as well as personnel facilities.

Work is organized on a continuous flow basis. Instructions are received by the department as to part, size and type of stock, and expected production per machine-hour. Assignment of specific machines and machine-time scheduling are made by the department dispatcher, who thus directs the flow of material. Foremen participate in scheduling considerations based on quantity, quality, and personnel required.

As stock is received from outside sources of supply, it is subjected to raw material inspection, under Kodak's quality control division. Inspection includes visual and dimensional tests, and, frequently, complete chemical and metallurgical analysis. Only after approval is the material released, either directly to the stock-room or to central warehouse facilities.

Within the screw machining department, material is sent to the machines by scheduled dispatch. When parts are completed, they are sent to the "separator group." At this point, parts are centrifuged to reclaim the oil, blower-treated to remove chips, and run through wash tanks for dip cleaning. From there, they go to inspection. Approved parts are then routed to the stock-room where they are ticketed. After completion of a production lot, it is released for subsequent operations in other departments. A copy of the original production order is used as a shipping ticket. In the salvage operation, turnings are segregated and sent to the salvage department for disposal.

Production Techniques Employed

Aluminum is machined at the highest cutting speeds available on the machines. Kodak generally uses high-speed steel tools but, in some cases, employs tungsten-carbide tools. Tolerances on aluminum parts are usually maintained within plus or minus 0.001 inch.

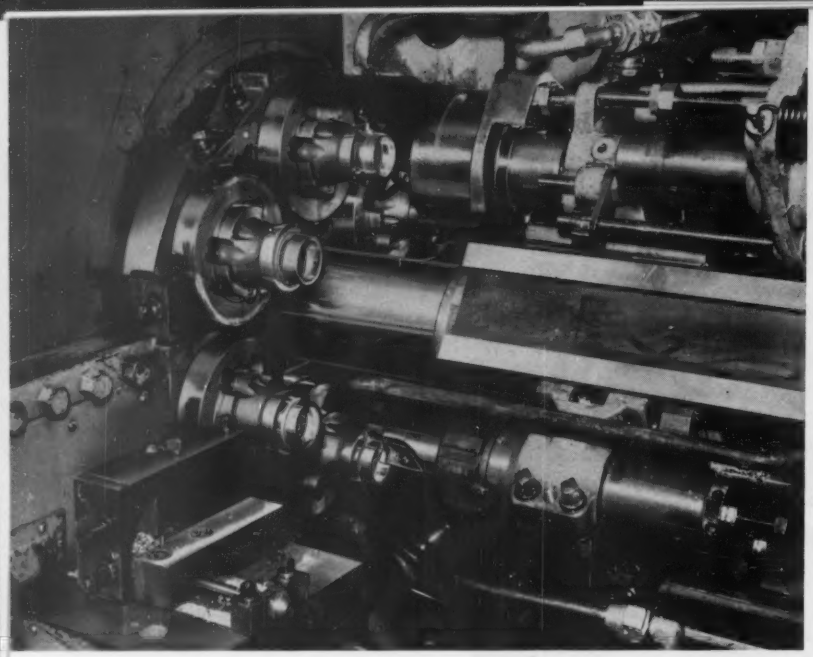


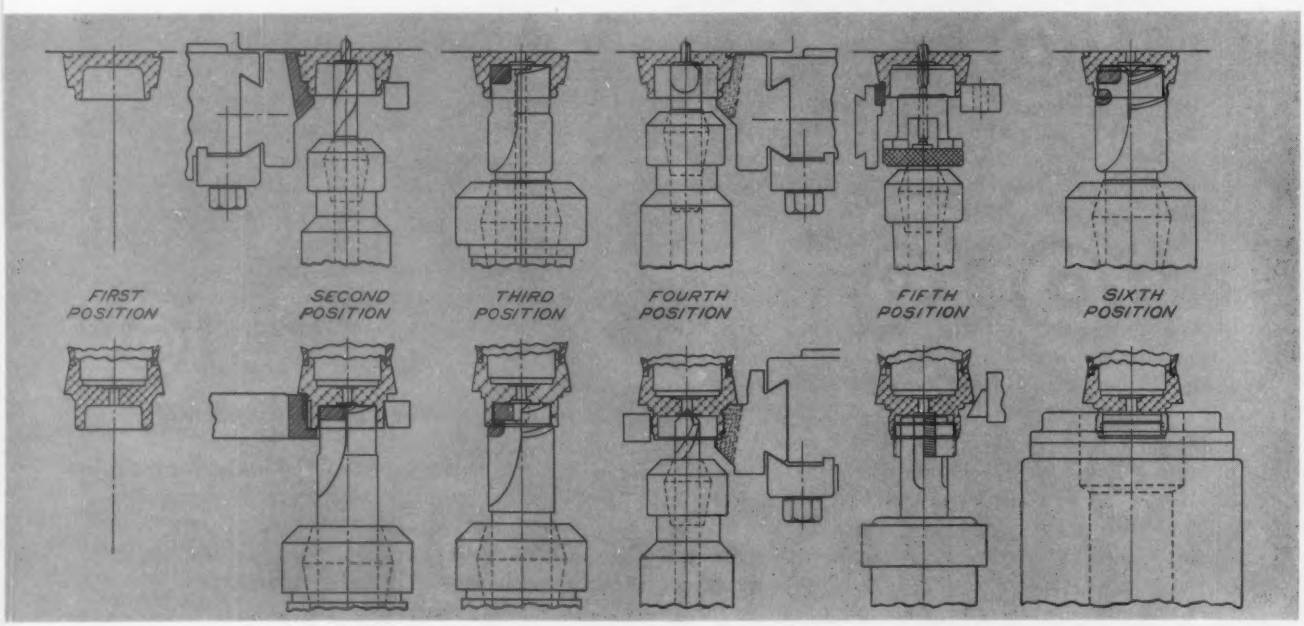
Fig. 5. Tooling on a six-spindle, automatic chucking machine for turning, forming, counterboring, chamfering, tapping, and threading fuse bodies

Of vital importance in machining aluminum is the smoothness of the tool surfaces. Special techniques developed for tool preparation have resulted in routine output of tools with very smooth surfaces. With aluminum, this permits better sliding of the chips over the tool surface to avoid galling.

The standard coolants employed in machining aluminum and brass are principally paraffin base oils. Coolants for ferrous alloys are generally a mixture of sulphurized base oils and paraffin. Water-soluble coolants are also used, and a trade brand of a kerosene derivative is applied in certain situations. Choice of coolants is subject to approval by the safety and medical departments, which supervise the company's safety code. Although choice of material rests with the manufacturing and engineering divisions, considerations such as the likelihood of dermatitis and explosion hazards fall under the safety code.

The quality of screw machine product output is a supervisory responsibility. Foremen are held responsible for operations under their di-

Fig. 6. Successive operations performed on fuse bodies. Operations at top are done on first six-spindle automatic, those at bottom on second machine.



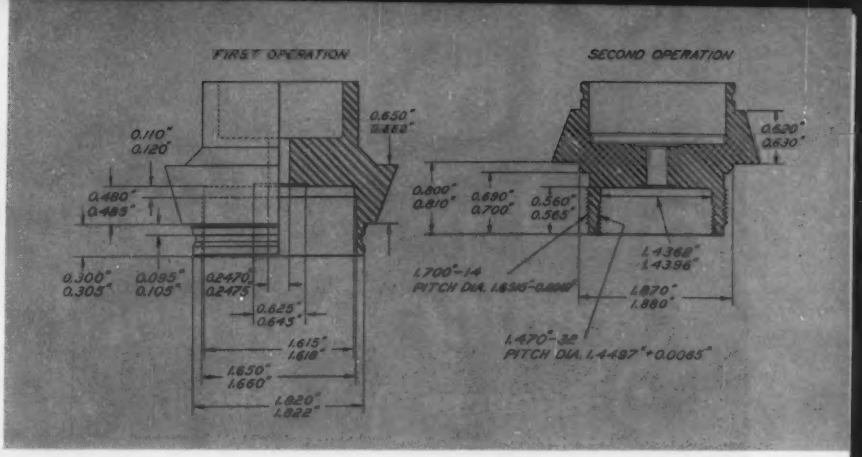


Fig. 7. (Left) Aluminum fuse body as it appears after the first series of operations, and (right) as it comes off the second machine

rection. Within the department itself there is constant checking at all stages. Set-ups must be approved before runs are made, and samples from the machines are checked at regular periods during a run. Statistical sampling techniques are used wherever they are of value.

Special Machining Operations

In operations on material other than bar and rod stock, there are several outstanding examples of high-production, close-tolerance machining at the Camera Works. Two examples are the production of camera shutter cases and of fuse bodies for special ordnance work. Shutter cases are made by a combination of punch press and screw machine operations. A major factor in determining the use of aluminum for this application was the weight advantage.

These shutter cases are made from aluminum-alloy strip stock having age-hardening properties that make it necessary to complete forming within eight hours after annealing. The first operation performed on the strip stock is blanking and drawing, producing the part which is shown at the left in Fig. 3. Then the parts receive the first of two screw machine operations involving turning, facing, boring, threading, and tapping on Brown & Sharpe No. 2G automatic screw machines. The case then appears as seen at the center.

The partially machined pieces then go to a second punch press operation, involving perforating and stamping. In this form they return for finishing on the screw machines. Finish-machining consists of turning, facing, and serrating—producing the shutter case illustrated at the right in Fig. 3. Final machining is performed at cutting speeds approximately twice those employed for the first operation.

Aluminum fuse bodies are received in the form of impact extrusions, such as the one at the left in Fig. 4. Four New Britain six-spindle automatic chucking machines are employed to produce these parts, two of the machines being similarly tooled for the first series of operations, and the other two tooled alike for the second series of operations. A close-up view of the tooling area on one of the second pair of machines is seen in Fig. 5.

At the initial position on the first six-spindle automatic machine, the aluminum impact extrusion is chucked. Then, when indexed to the second position on the automatic, top row in Fig. 6, the body is rough-turned (1.821-inch diameter), rough-formed, and rough-drilled (0.244-inch diameter), and counterbored (5/8-inch diameter). At the third position, the extrusion is rough-counterbored to a diameter of 1.595 inches. The periphery of the fuse body is finish-formed, the 0.244-inch diameter hole bored, and the 5/8-inch diameter counterbore chamfered at the fourth position. When the work-piece has been indexed to the fifth position, its small bore is finished-reamed to a diameter between 0.2470 and 0.2475 inch. Also, at this same station, a shaving tool and back-up roll are employed to finish-size the 1.821-inch diameter on the periphery. The fuse body is finish-counter-bored (1.615- and 1.650-inch diameters) and chamfered at the sixth and final position on the first automatic chucking machine—producing a part such as shown at the left in Fig. 7.

When the fuse body has been tranferred to the second automatic, six-spindle machine, it is chucked on an expansion arbor. Then the part is successively rough- and finish-turned, rough- and finish-formed, rough- and finish-counterbored, chamfered, tapped, and externally threaded, bottom row in Fig. 6. The part appears as shown at the right in Fig. 7 when it comes off the second automatic.

Fuse bodies leaving the screw machine department must pass an inspection involving fifty-two separate gaging operations before they receive secondary machining. This involves drilling and tapping the parts on Kingsbury multiple-spindle machines, two passes on a Footburt broaching machine, and chamfering.

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Aluminum Alloy	A54S	An alloy that exhibits strength at elevated temperatures. It can be welded by all conventional methods; the semi-automatic inert-gas metal-arc process and the inert-gas metal-arc process (tungsten-arc) are preferred, however.	For the construction of unfired pressure vessels in accordance with the rules of Section VIII of the 1952 A.S.M.E. Boiler and Pressure Vessel Code.
Polyester Resin	AR493	A high heat resistance permits its widespread use in electrical applications where high operating temperatures are being used.	Its chemical-resistant properties make possible its use on exhaust ducting for chemical fumes, chemical storage and transportation tanks, washer tubs, etc.
Hard Rubber Compound	Ace Temperon	A heat- and chemical- resistant synthetic hard rubber compound that exhibits great rigidity. Large fittings may be produced by forming sheets of this material around cores or mandrels while still soft, prior to vulcanizing	Available in the form of molded parts; and sheet, rod, and tube for machining a wide variety of shapes.
Buffing and Polishing Compound	Acme Greaseless Composition	The composition, when applied to a wheel face, adheres strongly to form a heavy fast-drying "head" which does not fly off and remains firm even in the warmest weather.	Used on brushes and buffing wheels to give good results in cutting, polishing, deburring, and satin finishing of all metals.
Metal Cleaner	Actane 33	When used in combination with sulphuric acid, it removes silica, sand, and scale from steel and can etch aluminum. When used with nitric acid and ferric sulphate, it can be used to pickle stainless steel.	For cleaning and pickling ferrous and non-ferrous metals. When used with nitric acid, it removes silicon and copper from aluminum to produce clean surfaces.
Rustproof Coating	Adelphi One Coat Counter-Rust	This material, which is easily applied, isolates and neutralizes minor rust spots.	Steel is protected for periods of from five to ten years upon application of one coat.
Aluminum Alloy	Alcoa C57S	When Alumilite-treated, it approaches highly pure aluminum in metallic luster and sheen of its finish. It has good forming characteristics.	Can be used as a replacement for chromium and stainless steel in automobile or refrigerator trim and giftware.
Aluminum Alloys	Alcoa XA54S Alcoa XC56S	XA54S, an aluminum-magnesium alloy, has mechanical properties between those of 52S and 56S. XC56S is similar to 56S but has improved welding characteristics. Both alloys are weldable using the inert-gas metal-arc process (argon tungsten) or the semi-automatic inert-gas metal-arc process. Resulting welds are ductile and have high elongation.	XA54S is used for welded ship superstructures and barges; for pressure vessels and heat exchanger shells; and for bulk hauling equipment. XC56S is used for welded structures where strengths higher than those obtainable in 52S and XA54S alloys are required.
Aluminum Coating Process	Aldip	A dipping process for coating steels and other ferrous metals with aluminum to impart corrosion-resistant properties.	This process is used in coating heat exchangers, automotive mufflers, tail pipes, steel hangers, and paint rack fixtures.

For names and addresses of manufacturers of products listed, see end of this section

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Paint Stripper	**Alk-A-Sol**	This paint stripper removes organic resin and pigmented coatings from steel, zinc, and magnesium alloys. It is non-flammable and non-volatile.	It is applied in steel tank baths in varying concentrations in a temperature range of from 100 to 225 degrees F. Treated parts will rinse clean by spraying.
Chromium-manganese Steel	**Allegheny Ludlum Chromium-Manganese Steel**	This steel exhibits good cold-working and non-magnetic properties, weldability, and ductility. As a result of a particular processing, it exhibited the following properties: yield strength, 113,150 pounds per square inch; tensile strength, 142,-600 pounds per square inch; elongation in 2 inches, 21 per cent; and a hardness of 29 to 31 Rockwell C scale.	To be used where straight chromium steels are unsatisfactory substitutes for 18-8.
Metal Filler	**All-State Metal-Filler**	A cold-applicable, waterproof, rustproof, non-shrinkable metal filler that will not crack, chip or peel. It forms a permanent bond with any metal, wood, plastic, or glass, and once applied can be milled, drilled, tapped, ground, and filed.	The filler can be used to repair blow-holes, surface blemishes, and rough porous places in metal castings and metal surfaces; make seams leakproof; repair leaks; and rebuild worn metal surfaces.
Welding Rods	**All-State No. 356**	These aluminum-alloy welding rods are used for the reclamation and repair of castings both at the foundry and machine shop. Advantages resulting from their use are a low shrinkage factor, good corrosion resistance, good weldability, and high resistance to hot cracking.	The rods are particularly adapted for use where the deposit is to be heat-treated after welding to restore the original physical properties of the base metal.
Silver-bearing Solder	**All-State No. 430**	The solder contains no lead, zinc, or cadmium, and can be chromium-plated. Some of the physical properties of soldered stainless steel, copper, brass, and other metals are tensile strength, 10,000 to 28,000 pounds per square inch; shear strength, 10,000 to 15,000 pounds per square inch; and elongation in 2 inches, 10 to 28 per cent.	Applicable by means of a soldering iron or torch. It can be used on electrical connections, corrosion-resistant assemblies and fabrications that operate at temperatures too high for lead-tin solders.
Die-casting Coloring Agent	**Aluminum Oxide Compositions**	These aluminum oxide compositions give castings a luster or color quickly.	For coloring zinc-base and aluminum die-castings. Can also be used to color steel.
Hardening Compound	**Armor-Tuf**	This compound imparts a high surface hardness and wear resistance without developing toxic fumes.	For hardening low-carbon steels.
Copper-base Alloy Stock	**Asarcon Alloys**	Available in rod, tubing, and many other symmetrical shapes from 7/16 inch to 5 1/8 inches in diameter or width and up to 20 feet long. These alloys, made by a continuous casting process, are uniform both in texture and properties.	For many machining and fabricating operations that require uniform properties and are benefited by the use of symmetrical shapes with good, smooth surfaces.
Cutting Oils	**Atlantic Cutting Oils 20 through 45**	These non-rancid, non-staining cutting oils reduce friction, provide adequate cooling, and exhibit good anti-weld and metal wetting characteristics.	For multiple-purpose cutting oil applications.
Phenolic Resins	**Bakelite Phenolic Resins**	These resins have been used as a sand binder in making precision sand cores for aluminum castings. They help to provide the permanence of form needed to prevent distortion of precisely molded cores when removed from the core-box.	Cores produced using these resins withstand the pressure of molten aluminum at 1425 degrees F. long enough to accurately shape the interior of the casting.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Resins	**Bakelite BR-18774 BR-18795**	These two Bakelite C-8 resins may be used with four hardeners to form strong, lightweight products. They cure to hard solids at low or room temperatures and can be combined with many types of inert fillers.	Dies for drawing metal, checking fixtures, frames, patterns, and tooling jigs have all been made from these resins.
Protective Coating	**Barcote No. 600**	A leaded-petroleum compound developed for the protection of metal surfaces against corrosion. It will flow at 0 degrees F., does not emulsify with water, has a strong affinity for metals, and is soluble in petroleum solvents.	Recommended for corrosion protection of structural steel and sheet metal, protection of rails and rail joints, lubrication of wire rope, and protection of parts in storage.
Beryllium-copper Alloy	**Beryldur**	A copper-base material of low beryllium content that combines the properties of the high-strength and the high-conductivity groups of beryllium-copper alloys in use today.	This material has potential applications in the field now occupied by phosphor-bronze and brass.
Ferrous Metal Blackener	**Black Magic S.S.**	Used in a one-bath process operating at a temperature of 225 to 260 degrees F. This blackener produces a lustrous adherent black finish which will not chip, flake, or peel from parts immersed from five to fifteen minutes in the bath.	For blackening stainless steel, and cast and malleable irons.
Brazing Materials	**Braze-Clad**	These silver brazing materials can be used to join ferrous and non-ferrous metals, similar as well as dissimilar. Voids and oxide islands are eliminated. The alloy is "anchored" through heating.	Typical applications include joints of large-area, pressure-tight joints, blind joints, and joints between powdered metal parts.
Solvent Degreaser	**Brulin Solvent Degreaser**	This highly concentrated solvent for degreasing and cleaning operations does not contain carbon tetrachloride or other toxic chlorinated solvents. It is non-flammable and does not require special clothing or ventilating equipment.	For use on production lines where speed is essential. It has been employed for cleaning electrical motors, having no adverse effects upon the electrical installation.
Solder	**Cen-Tri-Core**	A rosin-coated solder wire covered with an outer solder sleeve. Its unique construction makes it possible to provide a solder wire with no flux voids and a means whereby flux can be made to flow ahead of the molten solder.	For general-purpose soldering. Despite its high activity, the rosin is non-corrosive and electrically non-conductive.
Welding and Soldering Rod	**Chemalloy**	A cast triangular zinc rod containing aluminum, brass, lead, tin, silver, nickel, and other chemicals. No fluxing, cleaning, or other preparation is necessary prior to use.	Aluminum- or zinc-base alloys can be joined by soldering, brazing, or welding through its use.
Bonding Agent	**ChemoTec**	Formulated for joining metals to each other, to dissimilar metals, and to non-metallic materials such as ceramic, glass, or wood.	Available in rod, powder, paste, and liquid forms. It is said to be a new method of joining titanium, aluminum, and similar difficult-to-bond metals.
Chromizing Process	**Chromalloying**	Makes iron and steel heat-, corrosion-, and wear-resistant. The process transforms the ferrous metal surface into a high-chromium stainless metal or into a chromium carbide embedded in a high chromium-alloy matrix. The treated surface has a silver gray, satin smooth finish, which can be polished, lapped, or burnished into a high-luster finish at a slight sacrifice in corrosion resistance.	Can be applied to all kinds of cast, wrought, and machined irons and steels with the exception of high-speed steel and free-machining screw stock. Treated parts include tool and die components of forming tools, nuts and bolts that are subject to heat, etc.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Leather Belt Preservative	**Clarol**	This preservative contains no oil, grease, or resin, and will not turn rancid. It "sets" in the leather to form a gelatinous structure that does not creep to the surface. Belts so treated repel water and steam.	Applied by brush, spray, or oil-can methods. It penetrates and acts as a lubricant for the fibers of leather belts.
Hard-facing Alloy	**CM-199**	Exhibits resistance to abrasion at high temperatures, the ability to withstand attack by molten copper, and good welding characteristics. Arc-welding deposits are non-porous and crackfree.	It has found successful application as a hard-facing for large guide rolls, hot friction guides, and soaking tong bits. Provides protection for the lips of copper converters.
Cast Plastic	**Cocor CR-39**	A cast allyl base plastic with the transparency of glass, exhibiting a high impact strength and resistance to flying abrasive and metal particles.	Used for making the eye-guards of grinding machines.
Aluminum Alloy	**Cond-A1**	An aluminum alloy containing small quantities of iron, magnesium, and silicon that is light in weight and has high electrical conductivity.	For use in high-temperature applications such as field windings on steam turbine generators.
Copper-clad Steel	**Conflex Copper-clad Hardenable Steel**	This material consists of a layer of medium-carbon steel with a relatively thin layer of copper clad to one or both sides. It is highly conductive electrically and thermally, has good ductility for extreme forming, has good spring properties after heat-treatment, and exhibits resistance to corrosion.	For use in the fabrication of parts that require good electrical and thermal conductivity, spring characteristics, and ductility.
Degreasing Agent	**Cottentex**	A soft, finely ground cellulose fiber material with high absorbency for use in degreasing and drying operations that employ tumbling mills.	The agent is particularly adapted for greasing ball, roller, and needle bearings, and any other parts that can be processed in a tumbling mill.
Hard-facing Alloys	**Crobalite**	Three cobalt-chromium-tungsten hard-facing alloys in welding rod form. They are applied to steel and cast-iron parts to provide high hardness and good resistance to abrasion, corrosion, oxidation, and impact.	These alloys are applied by oxy-acetylene or arc welding, either manually or by semi-automatic machine, using standard hard-facing procedures.
Rust Inhibitor	**Crown Rust Inhibitor**	An animal fat base rust inhibitor that has some lubrication qualities, will withstand normal handling, and is non-toxic, and non-flammable.	Applied by spray or dip methods. This inhibitor can be used for all types of machined parts.
High-temperature Steel	**Crucible 422**	This ferritic or relatively low-alloy steel contains about 13 per cent chromium, less than 1 per cent nickel, and small amounts of vanadium, molybdenum, and tungsten.	Can be used in making bolts for turbines and other equipment subject to elevated-temperature operation.
Phosphatizing Material	**Crys-Coat HC**	This material provides a complex zinc phosphate coating that is crystalline in nature, and has a weight ranging from 200 to 1200 milligrams per square foot.	For coating iron and steel to promote adhesion of paint to the metals.
Dry-film Coatings	**'dag' Dispersion Nos. 213 and 223**	These two products—the first of which contains colloidal graphite and the second, colloidal molybdenum disulphide—give films that adhere well and are wear-resistant. They are unaffected by oils and solvents and can be used at temperatures up to 500 degrees F.	Typical uses for these products include dry lubricating films for high-temperature screw threads, precision gears, bearings, and shafts.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Cutting Oil	Dasco	A soluble base oil that exhibits stability and resistance to rancidity and is used to make lean mixtures of oil and water for metal-cutting and grinding.	Mixtures consisting of forty parts of water to one of the oil are used for milling, drilling, turning, etc. Grinding mixtures are prepared in a ratio of 100 to 1.
Casting Alloys	DC-50	This hardenable corrosion-resistant alloy having the same nominal composition as Armco 17-4 PH hardenable stainless steel alloy, is readily machinable in the solution-annealed condition, and when hardened has appreciable ductility and toughness.	Recommended for applications where wearing conditions exist, such as ship propellers and pump impellers; also used as a casting material for structural parts of aircraft and for thrust bearings.
Steel-cleaning Compound	Detrex 61	A high wetting, high penetrating, and free-rinsing compound that does not contain fatty acids or resin soaps. It removes oil, grease, and dirt from all ferrous parts.	Intended especially for use as a precleaner for steel that is to be deep-drawn or extruded.
"Plastic-Metal"	Devcon	A product composed of a combination of fine steel powder and a hardenable plastic. It becomes a strong, tough, and rigid metallic piece approximately two hours after forming. It does not shrink or distort, is resistant to many solvents, oils, and acids, and is capable of being plated with chromium, nickel, or copper by conventional methods.	It is as easy to form as modeling clay and is used for making durable and permanent drill fixtures and jigs, forming and drawing dies, and holding devices.
Strippable Coating	Dip-Pak No. 637	This hot-melt plastic coating does not exude oil on standing at room temperature. It is tough, flexible, and strong; melts at 360 degrees F.	For permanent and temporary coatings on metal surfaces.
Strippable Coating	Dip-Pak No. 661	This hot-melt, strippable coating exhibits no oil exudation and will remain flexible up to temperatures of 160 degrees F., is transparent, clear, and resistant to darkening under heat.	It functions as a semi-permanent coating for metal objects, as a strippable coating for metal, as an insulating and potting compound, and as a plating stop-off.
Magnesium Alloy	Dowmetal AZ91B	A magnesium alloy containing beryllium designed to lower melt loss and increase efficiency when using magnesium for die-casting.	Available in ingot form for the commercial magnesium die-casting industry.
Metal-forming Lubricant	Drawcote	An odorless non-flammable protective and lubricating film is formed when using this lubricant.	Applied to metals prior to metal-forming operations by dipping or spraying. It is easily removed from formed parts by a hot, mild alkali bath.
Ferrous Metal Blackener	Dulite 3-0 Black	The compound is supplied in a dry-salt form and is mixed as needed. The maximum operating temperature required for processing is 240 degrees F.	Used effectively on stainless steels and also to produce a non-fading black finish on malleable iron.
Copper Oxide Remover	Ebonol "C"	Converts the cuprous oxide on the surface of copper alloys to cupric oxide without attacking the base metal. Cupric oxide is then readily removed, using dilute sulphuric acid or sodium cyanide.	Applicable to pure copper, tin-bronzes, brasses, and various alloys containing silicon and aluminum.
Spring Alloy	Elgiloy	A cobalt-base spring alloy noted for its high hardness, toughness, tensile strength, and corrosion and fatigue resistance.	Available as raw stock and in heat-treated and fabricated form. It is commonly used as a spring material in watches and electrical appliances.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Water-reducible Paint	Emulsion Type Enamel	This paint is an emulsion type enamel in which water is employed both as an ingredient and a reducing agent. It is not water soluble after application. Its glossy finish, which is very hard, has high impact and oil resistance.	May be applied by brushing or spraying. After application, the enamel can be machined or fabricated without damage to either the finish or the cutting tools.
Rustproofing Material	Endurion	A chemical immersion method of treating work-pieces made from ferrous metals. Products treated will withstand salt spray for long periods of time.	A coating that can be applied in colors ranging from gray and black through blue, green, and olive drab.
Stripper	Enthone Compound L-88	A ready-to-use liquid which, when used in conjunction with a 6-volt source, strips defective copper, nickel, and chromium plates from zinc base die-castings.	For stripping zinc base die-castings. Refinishing of the die-casting is accomplished by a light buffing operation.
Rust and Scale Remover	Enthone Compound 134	This compound derusts and descales metals by using a periodical reversing current. Base metals are not attacked and a surface for hard chromium-plating is produced.	Used to remove black heat-treat quenching and other scales on alloy-steel parts, as well as carbon smut.
Rust Preventative	Enthone Compound NR-31	A mildly alkaline, water-soluble material used in a concentration of one ounce per gallon, in still or spray wash tanks for treating metal parts against rust.	Recommended for the prevention of rusting following cleaning, pickling, descaling, burnishing, and tumbling.
Rust and Scale Remover	Enthone Descaler 2A	An acidic compound that dislodges oil films, promotes fast pickling, and gives clean surfaces as a result of its descaling or derusting action.	For tumble or barrel derusting or descaling oxide and scale from steel and for primary pickling.
Welding Rod	EutecRod 115	Exhibits low bonding heat, quick tinning action, long working range, and easy spreading properties.	Used primarily for sealing cracks and building up worn and poorly machined surfaces of cast iron.
Aluminum Mesh	Expamet Expanded Aluminum	This mesh is made in a variety of metallic and opalescent colors in diamond-shaped and other style meshes. It will withstand corrosive attack by acids, and will not chip, peel, or flake.	Has many general and industrial applications such as machinery guards, partitions, and screening.
Vacuum-melted Alloys	Ferrovac-52100	The vacuum melting of steel as well as high-purity nickel, copper, iron, and alloys of these metals facilitates the precise control of very dilute alloying additions and impurity traces in producing these alloys.	Used for making bearing balls and electronic tube components.
Tubing	Flexon	A thin-wall stainless-steel tubing available in standard and high-strength classifications for industrial uses where corrosion resistance, light weight, and special shapes or bends may be required.	Fittings and component parts made from this tubing can be attached to either straight or flexible tubing by resistance circumferential seam-welding.
Metal Degreaser	Flo	This solvent is relatively odorless, and easy to handle and use. It dries quickly without leaving any film or sticky residue and is non-corrosive.	For degreasing parts and engine and electrical accessories.
Die Steels	FM	Select B, GSN, Cobalt Chrome, and BR-4, types of steel that possess the "free-machining" properties of Olympic FM air-hardening die steel.	For numerous die steel applications. The improvement in the machinability of these steels has no effect on their other physical properties, nor do they require any change in the normal heat-treatment.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Soldering Flux	**Fusion Electro-Tin TE-400**	A combination of organic, fast-acting fluxing agents and finely divided metal-tinning agents. These agents are non-acid and neutral but possess the characteristics of strongly active acid fluxes.	Originally for dip-tinning of transformer leads and dip-soldering of commutators, but has now found wide application in all fields of assembly where soft solders are used.
Cold Galvanizing Compound	**Galvanite**	For cold galvanizing the surfaces of steel and iron. Forty minutes after application it is tack-free and is completely dry in forty-eight hours.	Applied with paint brush, electric spray gun, or by cold dip on steel and iron surfaces.
Welding Electrode	**G-E Type W-610-A**	A direct-current reverse-polarity rod meeting AWS Class E-6010 specifications. It has the ability to take high currents, together with freedom from reaction pitting and blistering of the coating, and assures a high ratio of inches-of-welding to inches-of-electrode used.	Typical applications included the welding of pipe and steam lines, ship structural frames, bridges, and unclad pressure vessels.
Stainless-steel Filter Sheet	**Grade X**	This filter sheet is ductile, has a tensile strength of 25,000 pounds per square inch, and has a smooth surface. Thickness tolerances of plus or minus 0.002 inch are maintained in the manufacture of this filter sheet.	The sheet material is available in thicknesses of 0.020 to 0.125 inch with a mean pore opening of 10 microns, and has a variety of uses.
Tungsten Alloy	**High-Density Metal**	Has a specific gravity 50 per cent greater than lead, and is readily machined with carbide-tipped tools.	Used to screen radioactive rays and to correct static and dynamic unbalance.
Hollow Tool Steel Bars	**Hollow-Bar Tool Steel**	These hollow bars of tool steel were designed to facilitate the fabrication of ring-shaped parts which are now being cut out of solid bars or special forgings. The hollow bars are furnished with machined surfaces.	For the manufacture of can dies, trim dies, liners, ring gages, and similar products. Available in the following tool steels: Airdi 150, Ketos, and Sanderson.
Metal Cleaners	**Houghto-Clean 439, Houghto-Clean 440**	These cleaners—the first, an oily liquid, and the second, a white powder when mixed with water—form solutions which clean metal parts and provide rust protection.	Uses include the removal of drawing oils, pigmented compounds, sulphurized cutting oils, and soils.
Tapping Lubricant	**Hypertap**	This stick-form tapping lubricant contains a cutting oil which serves as a coolant in tapping operations. It is stable in storage and withstands temperatures up to 100 degrees F. without softening.	For blind-hole tapping. It is said that finishing or bottoming taps may be used from the very start of the thread-cutting operation.
Aluminum Alloy	**HZM 100**	An extruded alloy with good corrosion-resistant properties, especially at high stress concentration areas.	For aircraft structural use where light weight, strength, and resistance to corrosion are important factors.
Plastic Sealant	**Imprex**	This plastic sealant is used to permanently seal excessive "leaker" and even "squirter" pressure castings. After impregnation and hardening, a solid non-brittle bond with the pressure casting is formed.	This sealant does not require any special handling or storage, and before hardening may easily be washed off with water.
Free-machining Screw Steels	**J & L "1200" Series**	These steels are comparable in chemical composition and physical properties to the "1200" series steels listed by the American Iron and Steel Institute and the "1100" series of the Society of Automotive Engineers.	Available in cold-finished bar form for making screws, nuts, studs, bolts, and other small machined products.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Nickel-plating Process	**Kanigen**	This nickel-plating process will plate uniformly, regardless of size or shape. A surface produced by the plating has a hardness range of 550 to 650 Vickers; very low ductility; and an electrical resistance of approximately 60 microhms per centimeter.	It has been used for the interior coatings of tank cars carrying corrosive chemicals and for bringing overmachined parts back to proper tolerances. It has also been applied to cast-steel parts which substitute for similar parts made of Monel metal. Intricate valves difficult to plate can be covered thoroughly.
Aluminum Cleaner	**Kelite PWB No. 81**	A water-soluble detergent which removes virtually all types of soils. It is non-foaming, non-corrosive, and stable.	For the rapid cleaning of aluminum, anodized aluminum, and magnesium parts in power washing equipment.
Universal Cleaner	**Kelite Spray White**	It cleans rapidly without heat, odor, fumes, solvents, fire hazard, or danger to the skin by spraying and wiping. Hard rubbing or scouring is seldom required.	Applied by a hand-sized pressure spray gun. It safely removes grease, oil, wax, dirt, ink, light carbon, and other objectionable deposits from a variety of work-piece materials.
Cemented Titanium Carbide	**Kentanium**	This cemented titanium carbide resists oxidation at 1600 to 1800 degrees F., has a specific gravity range of from 3 to 4, a high hardness (Rockwell A 83 to 93), and an elastic modulus, or rigidity factor, about twice that of steel.	Used to make parts for elevated temperature service, such as turbine blades and nozzle vanes in gas turbines and jet engines.
Photographic Paper	**Kodagraph Contact Paper Translucent**	This paper, which will withstand considerable handling and use, is intended to promote faster print-back speeds when diazo or blueprint reproductions are to be made.	Use of this paper provides an advantage in that lines can easily be removed by a slight moistening followed by erasure with an ordinary pencil eraser.
Aluminum Metalizer	**Kolmetal**	Metallizing of surfaces with aluminum is possible by using this material. The finished surface can be polished, ground, drilled, or bent to a 45-degree angle without chipping or cracking.	It is used for food processing equipment, structural iron and steel, and ducts and piping. It exhibits resistance to corrosion and retains its finish and adhesiveness over a wide range of temperatures.
Rubber-base Plastic	**Kralastic**	This plastic is unaffected by soil acids or alkalies, has good dimensional stability, and can be completely immersed in water for long periods of time without adverse effects.	Is used in the manufacture of corrosion-resistant plumbing for handling water and corrosive chemicals.
Plastic Tooling Material	**L-930 Surface Casting Resin (Metallic)**	A plastic tooling material, consisting of a metal filler containing a hardener and a resin, which has a metallic appearance and a low viscosity. It has a two- to four-hour hardening time at room temperature. It bonds well with metals and is non-corrosive.	For resurfacing metal dies, leveling die bases to eliminate machining, and making formblocks, foundry patterns, and core-boxes. It can also be used for jig locator pads and hydraulic press wedge blocks.
Industrial Adhesive	**Liquid Adhesive**	This liquid adhesive will permanently fasten rubber, metals, wood, plastics, ceramics, or fibers together in any combination. It takes only fingertip pressure to join the materials together.	The cement has already been adopted for use in building machinery, radar, electronic equipment, etc.
Polyvinyl Plastic	**Lucoflex**	This plastic resists the action of most solvents, brine, and other corrosives. Exhibits a metal-like machinability and can be fabricated by all the usual processes. Is not affected by aging at elevated temperatures, and can be etched with vinyl inks for permanent coloring.	For making nameplates, instrument panels, and imprinted dials. Screws for mounting are also made of this plastic.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Copper-clad Steels	Lukens Copper-Clad Steels	Carbon steels clad on one side with either high conductivity copper for electrical applications or phosphorous deoxidized copper for welding applications.	Used in the fabrication of electrical apparatus, evaporators, tube sheets, hot water heaters, heat exchangers, and tanks.
Aluminum Alloys	Lurium L, L5, L10, and L20	These high-purity aluminum alloys have a luster that is durable and non-tarnishing (produced as a result of polishing) and are easily worked using standard fabricating techniques.	For use where high-purity aluminum is required and for applications where a reflectivity of 83 per cent of a silvered mirror may be desired.
Foundry Sand Resin	Lustrex 886	By eliminating the formation of clay balls from foundry sand, it improves sand workability. Also eliminates most of the cracks, fissures, and soft spots characterizing untreated sands.	Can be used in the ratio of 1 pound of resin to 1 ton of foundry sand for all types of foundry operations.
Plastic Fillets	Master Universal Fillets	These fillets are impervious to moisture, core oils, and liquid partings; and can be coated with shellac, lacquer, or any recognized pattern coating. They are durable, do not dry out, and maintain their dimensions under normal conditions.	Used in patternmaking to provide fillets for wood or metal patterns and core-boxes. Will conform to almost any shape or surface.
Aluminum Compound	Metalset (A 101)	This epoxy-resin aluminum compound adheres strongly to metal, particularly aluminum and many other surfaces. It is hard, tough, and machinable down to a feather edge and has good mechanical stability.	For repairing castings, filling joints in sheet metal, and building up surfaces of patterns, molds, and dies. It can be applied in any thickness without cracking and with negligible shrinkage.
Penetrant Dye	Met-L-Chek Flaw Finder	A water washable dye that penetrates ordinary seals for the detection of defects or flaws in metal, glass, and most plastic surfaces.	For testing parts on conveyor belts in production line set-ups and for maintenance purposes such as checking gears, shafting, and castings for fatigue cracks.
Strip Material	Microstrip	A close-tolerance grade of beryllium copper strip available in thicknesses from 0.001 to 0.032 inch with minimum tolerances ranging from plus and minus 0.0001 inch to plus and minus 0.0004 inch, depending upon thickness.	For general-purpose applications where close-tolerance beryllium copper is needed. Uniformity of hardness, formability, microstructure, and aging response are assured because of the solution annealing it undergoes during manufacture.
Lubricating Enamels	Molynamel	Solid lubricant films of these enamels are tough, adherent, and dry. They have a molybdenum base, and can be applied to any machine or instrument surface by employing ordinary brushing or spraying techniques and equipment.	For lubricating optical and electronic apparatus. Other uses are on tables of band saws, drilling machines, etc., where surfaces must be clean and oil-free.
Masking Tape	Mystik Brand Thin-flex Masking Tape No. 6207	Exhibits a positive holding quality at high temperatures, leaves no residue upon stripping, and performs under adverse weather conditions.	For all masking operations.
Pulley-lagging Material	Neolag	The lagging, which can be performed in place without removing the pulley from the shaft, entails the use of a primer, a cold bonding agent, and Neolag.	This Neoprene sheet material is used for lagging pulley surfaces.
"Baked" Protective Coating	Nerva-Kote Tae	Resists alkalies, acids, and solvents, adheres to all surfaces, and has good flexibility and long life. It exhibits weather, impact, and abrasion resistance.	For the protection of duct surfaces, machinery, vessels, walls, tanks, etc. The coating produced is similar to one that is baked.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Thin-gage Strip	Nickel-Silver Strip	This malleable and ductile metal is tough and highly resistant to corrosion, wear, and fatigue. It is custom rolled up to 6 inches in width and down to 0.0005 inch in thickness to tolerances as close as plus and minus 0.0001 inch.	Typical uses for this 18 per cent nickel-silver strip include diaphragms, radio and telephone springs, and other stamped, drawn, or spun articles.
Aluminum Alloy	66S	A strong, lightweight aluminum alloy which is economical to use, since thinner sections may be employed in the making of structural elements.	Applications include structural members in buildings, large motor vehicles, and aircraft.
Silver Brazing Flux	No. 1200	This flux melts at a temperature lower than the melting points of the brazing alloys employed and forms a coating of fused salts over the brazing area. It prevents oxidation of the surface during heating, brazing, and cooling; cleans and floats off dirt or oxides; and reduces surface tension of the molten alloy so that it flows freely.	For silver brazing ferrous and non-ferrous metals.
Metal Cleaner	Oakite Composition No. 26	It possesses the ability to wet and penetrate heavy soils quickly which are removed by subsequent rinsing. No insoluble or oily films are left on surfaces after rinsing to interfere with painting or plating.	Typical applications include removal of pigmented drawing compounds, solid-particle dirts and smuts; cleaning before vitreous enameling; and precleaning buffed metal before electroplating.
Paint Strippers	Oakite Compositions No. 56 and No. 57	These strippers contain no phenols, cresols, acids, or alkalies, and can be used safely at full strength and in an unheated condition.	Designed for tank immersion stripping and brush-on stripping of a variety of alkaline-resistant paints and lacquers.
Aluminum Etchant	Oakite Composition No. 60	Gives a controlled etch of any desired depth while imparting a velvet-like appearance to the surface. Does not form a hard scale build-up on tanks and coils.	For etching aluminum uniformly without excessive foaming.
Soft-metal Cleaner	Oakite Composition No. 80-A	This composition, which may be used in soak tanks or pressure spray washing machines, is readily soluble in hot water and rinses off with hot or cold water.	For cleaning aluminum, tin, and other soft metals in aircraft and other plants where good cleaning and safety are essential.
Die-casting Cleaner	Oakite Composition No. 95	This composition removes surface films, disturbed metal, and traces of soil which are among the major causes of peeling, blistering, and dulling of electroplates.	For electrocleaning zinc-base die-castings prior to plating.
Derusting Compound	Oakite Rustripper	An alkaline derusting and descaling powder that may be used in hot or cold solutions, and may also be used with direct current to remove deep-pitted rust, or with reverse current to remove heat scale. It does not cause hydrogen embrittlement or create troublesome fumes.	For derusting precision parts where dimensional change and acid embrittlement must be avoided. Also used for descaling heat-treated titanium in aircraft plants.
Wear Strips	OK Wear Strips	These strips, consisting of a machinable steel base with a wearing surface of aluminum bronze, have surfaces that are ground to close tolerances.	Available in assorted sizes, these strips are used in the fabrication of machines and other general wear applications.
Die Steel	Olympic FM	A free-machining, high-carbon, high-chromium, die steel of the D-2 cold-work die steel type. It may be machined at speeds and feeds in excess of those normally possible with standard D-2 steels.	Use of this material will produce machined surfaces that require a minimum of finish-grinding.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Strippable Film	**Peel Filmite**	A paint spray booth protective coating which, when used in regular spraying equipment, provides a fireproof, peelable film. The film resists the action of alkalies, acids, oils, and many other chemicals.	It is applied to the walls of a paint spray booth. When paint overspray accumulates, the paint-laden coating can be peeled off in big sheets.
Honing Coolant	**Pelron No. 560**	This coolant combines the heat-dissipating qualities of water with the cleansing and anti-rusting qualities of kerosene. It contains a high percentage of liquid detergent, an extreme-pressure agent, and a rust preventative.	A water solution of this compound is used as a coolant for many metal-honing operations.
Casting Impregnation Process	**Polyplastex "MC"**	A process for the impregnation of castings to make them impervious to the corrosive attacks of non-flammable hydraulic fluids, as well as to insure the elimination of micro-porosity.	Used to impregnate parts in systems that employ hydraulic fluids and also to impregnate mortar shell castings.
Stainless Steel	**Powdered Stainless Steel**	Powdered, prealloyed stainless steels available in AISI Types 316, 304, 302-B, and 431.	For fabrication of filters, self-lubricating bushings, and water meter parts.
Metal Cleaner	**Powrite**	This rust-inhibiting compound which is dust-free, granular, water-soluble and low-foaming may be used in power washers, tanks, or spray booths in concentrations of 1/2 to 4 ounces per gallon of either hot or cold water. Rinsing after cleaning is unnecessary, although advantageous for some applications.	Used for removing oil, dirt, chips, and abrasives from all types of metal surfaces. Other uses include cleaning before phosphatizing; maintenance cleaning of paint; and conditioning hard water.
Scale and Rust Remover	**Quick Pik**	A water solution of this dry acidic salt mixture minimizes the attack of the acid on the base metal and produces a foam which covers the surface of the solution, eliminating acid spray and reducing fumes to a minimum.	For removing scale and rust from all types of ferrous metal parts.
Titanium Alloy	**Rem-Cru A-110AT**	A single-phase all-alpha grade titanium-base alloy that contains 5 per cent aluminum and 2 1/2 per cent tin. It exhibits good welding and hot-working characteristics, and provides elevated temperature strength.	Recommended for all titanium parts requiring maximum strength in the temperature range of 700 to 1100 degrees F.
Cast-aluminum Plates and Bars	**Reynolds Cast-Aluminum Plate and Bar Stock**	These plates and bars exhibit a tensile strength of 25,000 pounds per square inch, as cast; an average Brinell hardness of 70 (B scale); and an elongation of 0.5 per cent in 2 inches. They are easily machined and can be welded.	Plates are used for the construction of hydraulic press form-blocks, hydraulic stretch-forming dies, jigs, fixtures, and other tooling. Large-sized cast-aluminum bars find application as fixture bases on spar mills.
Corrosion-resistant Coatings	**Ricwilite 1060 Ricwilite 7100**	The first of these two phenolic resin coatings is a heat-hardening type which forms a chemically inert, insoluble, corrosion-resistant coating that is hard and tough, glass-like in appearance, yet flexible and elastic. The second is a cold-setting type with similar properties.	Used in the production of ventilating and duct systems, drill pipe, piping and equipment in food and chemical process plants, oil refineries, pulp and paper plants, and storage tanks.
Copper Dipping Process	**Rossaul Copper-Brite**	Removes atmospheric oxides and simultaneously passivates metal to resist oxidation for periods from three to six months. Materials used are non-toxic, non-fuming, and will not etch or discolor silver solder.	For the brightening and passivation of copper and most copper alloys.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Lead-bearing Steels	**Rycut 20 and 40**	Rycut 20 is a low-carbon carburizing grade of lead-bearing AISI 8620 steel which has good machinability and may be heat-treated in a manner similar to the standard AISI 8620. Rycut 40 is standard AISI 4140 alloy. Addition of lead does not change the heat-treating characteristics or the hardenability.	For applications which require steels that will machine up to 50 per cent faster than standard medium-carbon alloy steels. Mechanical properties of both the leaded and non-leaded steels after heat-treating are said to be identical.
Hammer Finish Enamel	**Sanco Hammer Finish**	This enamel is easy to apply, has uniformity of pattern, is chip- and scratch-resistant, and does not require the use of a primer.	Available in a wide variety of colors. The enamel is applied by spray methods.
Abrasive Material	**Sand Screen**	A non-clogging, open-mesh material designed especially for sanding operations where loading or glazing is a problem.	Material can be used wet or dry for both machine and hand sanding operations.
Coolant-lubricant	**Shear-Speed Soluble Oil**	A non-rancid, odorless, stable soluble oil that contains an additive to protect the operator's hands against dermatitis.	For use in practically all types of metal-cutting, grinding, and forming operations.
Lithium-base Grease	**Shell Alvania Grease**	This grease has a high water tolerance, broad operating temperature range, high pumpability and movement at low temperatures, low rate of oxidation, and good storage stability.	Used for many purposes where its specification properties are required. Its high pumpability and movement at low temperatures make it applicable for automatic grease systems.
Lubricating Oil	**Shell Rimula Oil**	An additive-containing oil that extends the service life of industrial engines by cutting down engine wear resulting from corrosion and fouling.	Best for Diesel engines operating on low-grade fuels, and in engines operating at low loads intermittently with high-sulphur fuels.
Rust-preventive Oil	**Siliconized Witch Oil**	A rust preventive that can be applied over a black oxide, phosphate, or other type of finish to impart good corrosion resistance.	Exhibiting water and moisture repellency and lubrication qualities, it is used for protecting work in process and finished parts in storage.
Metal Cleaner	**Solo-Phos**	This cleaner reacts with organic or metallic soils and provides an ideal base for paint. It will not attack rubber-tired wheels or painted and plated surfaces. Flash point is above 200 degrees F.	Applied in concentrated form by spraying, flushing, or dipping. It gives a rust-inhibitive phosphate coating to ferrous metals, aluminum, and zinc.
Metal Powder	**Stain-Alloy**	This stainless-steel powder is resistant to intergranular corrosion of the sintered compact. It is a bright, free-flowing powder, all particles of which pass through a 150-mesh screen, and approximately 60 per cent of which will pass through a 325-mesh screen.	Used by fabricators of gears, self-lubricated bearings, welding alloys, bushings, and small precision mechanical parts, as well as for conventional sintered parts.
Soldering Flux	**Stainless Steel "48" Soldering Flux**	This flux removes oxides without affecting the corrosion-resistant properties of the metal, promotes high capillary action of the solder, and is displaced from solid metal by the molten solder. Its residue can be easily removed with water.	Is used with the solder-iron, flame, or dip methods of soldering stainless steel; Monel; Inconel, Nichrome; and chromium, manganese, molybdenum, tungsten, and vanadium alloys.
Ductile Powdered Metal	**Steel Oilite**	An iron powdered metal having the ability to withstand high stresses without cracking. It exhibits great ductility and its physical properties are comparable to that of mild carbon steel. It can be plated by any of the normal processes and can be hardened by direct quenching, or carburized and hardened.	For machine parts such as gears, cams, brackets, and lever arms where ductility and strength are required.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Protective Coating	Steelast	This multi-colored coating is impervious to moisture, resistant to most chemicals, odorless, and non-toxic when dry. It will withstand constant wet heat up to 180 degrees F. and constant dry heat up to 300 degrees F.	Can be applied to rusted, and bare unrusted treated surfaces, and painted surfaces of machinery, pipes, tanks, duct work, and metal building materials by spray, brush, or dip methods.
Polystyrene Plastic	Styron 480	Parts made from this high impact resistant plastic may be molded around metal inserts and can also be stapled. It can readily be extruded into shapes or sheet, as well as fabricated on standard injection molding machines.	Applications include the making of such items as action toys, refrigerator pans, and portable radio cabinets.
Extreme-pressure Lubricant	Sunep	A lubricant which is available in several viscosities and is non-corrosive, has long life, acts as a rust preventive, and adheres well to gears.	Suitable primarily for enclosed gears but also effective for bearings and screws working under extreme pressures and in gear-reduction units.
Floor Coating	Sure Grip	An abrasive-filled plastic coating for floors, which is brushed on like paint. It dries within ten hours after application and resists the action of gasoline, oil, alcohol, and water.	Employed to eliminate spills and falls that result in injuries and time losses. It may be applied to wood, metal, or concrete surfaces and is available in two colors, red or gray.
Sealer	Tamper Proof Sealer EC-1252	This fast-drying sealer is applied over adjustable or removable parts to indicate changes in adjustment or other evidence of tampering by a break in the seal when the part is altered in position.	Access doors or removable panels on gages, and electronic or recording instruments are examples of industrial equipment that can be sealed off.
Cutting Oil Solvent	Tecsolv No. 427	This solvent is non-flammable, is approximately one-tenth as toxic as carbon tetrachloride and has approximately the same evaporation rate.	Used to replace carbon tetrachloride in cutting oils.
Bearing Lubricant	Texaco All Temp	This grease exhibits good shear stability, high oxide resistance, and the capacity to perform even when contaminated with water.	Used as a bearing lubricant over a wide temperature range, eliminating the necessity of storing and applying a large variety of greases.
High-nickel Alloys	Thin-Gage High-Nickel Alloys	Characteristics of these precision rolled thin-gage alloys include low expansion, high permeability, and high electrical resistance.	Typical uses include the manufacture of speedometers, navigation instruments, and telemetering devices.
Welding Compound	Thompson Anti-Spatter	Two types—No-Clean (SO-327) and Pickle-Off (SO-317). The first provides a firm foundation for paint and need not be removed before priming. The second is for use with chromium or stainless steel and where the job is to be pickled.	For all general welding applications, especially where pickling is to be done and where chromium or stainless steel is used.
Thread Compound	Thred-Gard	The compound eliminates seizing and galling at operating temperatures up to 1200 degrees F. It is non-hardening and acts as a lubricant to allow an easy disassembly of threaded connections even after long or severe service.	Protects against the welding action of threaded connections subjected to prolonged exposure at high temperatures, thus permitting the re-use of studs, bolts, pipe joints, etc.
Cutting Material	Titanium Carbide	This new carbide cutting material contains no tungsten or cobalt but uses nickel as a binder and molybdenum carbide as an alloy carbide addition. It has high wear resistance characteristics.	The life of tools made from this material is long when used for steady finishing cuts, particularly when high speeds and fine feeds are employed in machining hard abrasive steels.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Lock-nuts	Titanium Lock-Nuts	Each of these lock-nuts weighs less than half of a similar steel nut yet meets the same tensile strength specifications.	These nuts are available as 12-point (double hexagon) nuts with nylon locking inserts in a diameter size range of 5/16 to 5/8 inch.
Thin-gage Strip and Foil	Titanium Strip and Foil	Commercially pure titanium precision-rolled to very close tolerances in thin-gage strips and foil that possess good corrosion resistance and ability to withstand high temperatures.	Available in sizes as wide as 8 inches down to a thickness of 0.0005 inch within tolerances as close as plus and minus 0.0001 inch, for such typical uses as cowlings, ducts, and fire walls.
Laminating Resins	Toolplastik L-900 and Toolplastik Gelkote L-910	These non-shrink, non-laminating resins are neither corrosive nor brittle, and are easy to apply and cure at room temperatures. Special facilities and equipment are not required.	For use with glass-cloth reinforcing in such tooling applications as the fabrication of jigs and fixtures, models, and prototypes.
Hard-surfacing	Tungstide	A "metal-cladding" that imparts to a surface a hardness and an abrasion resistance almost equal to metallic tungsten, and is self-lubricating as well. It consists of metallic tungsten particles suspended in a liquid plastic into which is incorporated a hardening form of molybdenum disulphide.	Applicable by brush, dip, or spray methods. It may be used for reducing wear on plastic drilling, assembly, and checking jigs, and for replacing the metal inserts formerly used to cover wear spots on plastic molds and tools.
Aluminum Welding Flux	Type 202	Reduces oxides immediately upon application and becomes liquid when the metal is ready to weld, thus allowing operator to see exactly what he is doing while welding. Easy removal after welding; no corrosive pitting of parent metal.	Enables user to employ oxy-acetylene welding and serves as a back-up material on butt or T-joints to control penetration. Can also be used to eliminate the oxide notch on back of the work.
Stainless-steel Tubing	Unionweld	A stainless-steel welded tubing which does not require annealing after fabrication. The weld produced by the gas shielded-arc process is sound, ductile, and corrosion-resistant.	Produced in a size range of from 1/4 inch to 5 inches outside diameter with wall thicknesses of from 0.010 to 0.154 inch.
Thread-grinding Compound	Vantrol 5299M	This compound provides adequate lubrication in a process that requires heavy stock removal with a small area of wheel contact where the resulting pressure generates excessive heat.	Its use in thread-grinding applications reduces the rate of wheel wear, prevents uneven wheel wear, and permits a shallow cut to be taken when dressing the wheel.
Cleaning Compound	Vantrol 5541	An alkali compound that will not etch or discolor aluminum but will thoroughly spray-wash heavy soils from it. It is non-toxic and non-flammable.	Used mainly for aluminum but also for zinc, brass, copper, bronze, and ferrous metals.
Steel Powder	Vasco 4650-A	A pre-alloyed nickel-molybdenum steel powder that has good green strength and is readily moldable at low pressures to yield dense, strong compacts.	For powder metallurgical applications. Parts can easily be heat-treated and as a result of this heat-treatment possess a toughness comparable to that of alloy steel.
Vibration-absorbing Material	Vibraglass	Made of compressed and bonded glass fibers that will support vibrating loads as great as 2000 pounds per square inch from temperatures of minus 100 degrees F. to plus 375 degrees F. Shows no lateral expansion during compression and recovers immediately after load withdrawal.	Uses to which the material has been put are vibration-absorbing mountings for heavy and light machinery; lightweight shock-absorbing mountings for aircraft computing instruments; and vibration-muffling strips in forced-air furnaces.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Corrosion-resistant Coating	Vinsynite FS-3	This vinyl primer when baked as recommended provides a coating which adheres well to ferrous metals and provides resistance to all types of exposure.	Generally used for providing a corrosion-resistant coating under top coats. It is usually applied by roller coating.
Stainless Steel	V2B	Combines high hardness, non-galling characteristics, and good corrosion resistance. In the quench-annealed state it is readily machinable and may be hardened by a low temperature heat-treatment that produces no distortion. In the annealed condition, the material is easily welded, using special welding rods.	Applications include the making of such items as valve discs, plug cocks, shaft sleeves, impellers, pump casings, wearing rings, poppets, conveyor links, rollers, gear blanks, and other parts requiring both wear and corrosion resistance.
Nickel Alloy	Waspaloy	A nickel-based heat-resisting alloy that has high heat-resisting properties, permitting jet engines to operate for long periods of time.	For jet-engine turbine blades.
Chromium-iron Alloy	ZeVeScal	A work-hardening chromium-iron alloy exhibiting a good wear life under extremely abrasive conditions. It can be work hardened to hardnesses in excess of 700 Brinell on the wear surfaces.	It has sufficient toughness to make it suitable for paddles, sand impellers, and conveyor rolls in gravel mixers and similar machines where wear resistance is a prime requisite.
Industrial Paint	ZRC	A paint containing 93 to 95 per cent metallic zinc, which prevents the corrosion of iron and steel surfaces, employing the principle of anodic protection.	Applied by brush or spray techniques, it dries to the touch within thirty minutes and is completely hard in four hours. For maintenance protection of structures and equipment.

Names and Addresses of Manufacturers of Products Listed

A54S—Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

AR493—General Electric Co., Pittsfield, Mass.

Ace Temperon—American Hard Rubber Co., 93 Worth St., New York City

Acme Greaseless Composition—Hanson-Van Winkle-Munning Co., Matawan, N. J.

Actane 33—Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn.

Adelphi One Coat Counter-Rust—Adelphi Paint & Color Works, Inc., 86-00 Dumont Ave., Ozone Park 17, N. Y.

Alcoa C57S; XA54S; and XC56S—Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa.

Aldip—General Motors Corpn., 1775 Broadway, New York 19, N. Y.

Alk-A-Sol—Whitfield Chemical Co., Dept. 15-B, 14225 Schaefer Highway, Detroit 27, Mich.

Allegheny Ludlum Chromium-Manganese Steel—Allegheny Ludlum Steel Corpn., Oliver Bldg., Pittsburgh 22, Pa.

All-State Metal-Filler; All-State Nos. 356 and 430—All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.

Aluminum Oxide Compositions—Hanson-Van Winkle-Munning Co., Matawan, N. J.

Armor-Tuf—Armor-Tuf Sales Corpn., 299 Madison Ave., New York 17, N. Y.

Asarcon Alloys—American Smelting & Refining Co., Barber, N. J.

Atlantic Cutting Oils 20 through 45—Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa.

Bakelite Phenolic Resins; BR-18774 and 18795—Bakelite Co., a Division of Union Carbide and Carbon Corpn., 260 Madison Ave., New York 16, N. Y.

Barcote No. 600—Brooks Oil Co., 934 Ridge Ave., Pittsburgh 12, Pa.

Beryldur—Beryllium Corpn., Reading, Pa.

Black Magic S.S.—Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.

Braze-Clad—American Silver Co., 36-07 Prince St., Flushing 54, N. Y.

Brulin Solvent Degreaser—Brulin & Co., Inc., Dept. 295, 2939 Columbia Ave., Indianapolis 7, Ind.

Cen-Tri-Core—Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.

Chemalloy—Chemalloy Associates, Gillespie Airport, Santee, Calif.

Names and Addresses of Manufacturers of Products Listed

ChemoTec—ChemoTec Div., Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.

Chromalloying—Chromalloy Corpn. of New York, 109 W. 64th St., New York 23, N. Y.

Clarol—Viscol Co., 18 East Ave., Bridgeport, Conn.

CM-199—Coast Metals, Inc., Little Ferry, N. J.

Cocor CR-39—Cast Optics Corpn., Riverside, Conn.

Cond-Al—General Electric Co., Schenectady 5, N. Y.

Conflex Copper-clad Hardenable Steel—Metals & Controls Corpn., General Plate Div., Attleboro, Mass.

Cottentex—Cottentex Mfg Co., 405Q E. Wells St., Milwaukee, Wis.

Crobalite—Crobalt, Inc., 2800 S. State St., Ann Arbor, Mich.

Crown Rust Inhibitor—Crown Industrial Products Co., Park and Borden Aves., Sycamore, Ill.

Crucible 422—Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

Crys-Coat HC—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.

'dag' Dispersion Nos. 213 and 223—Acheson Colloids Co., Port Huron, Mich.

Dasco—D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.

DC-50—Donegal Mfg. Co., Marietta, Pa.

Detrex 61—Detrex Corpn., Box 501, Detroit 32, Mich.

Devcon—Chemical Development Corpn., Danvers, Mass.

Dip-Pak Nos. 637 and 661—Fidelity Chemical Products Corpn., 470-474 Frelinghuysen Ave., Newark, N. J.

Dowmetal AZ91B—Dow Chemical Co., Midland, Mich.

Drawcote—Gilron Products Co., 6007 Euclid Ave., Cleveland 3, Ohio

Dulite 3-0 Black—Du-Lite Chemical Corpn., Middletown, Conn.

Ebonol "C"—Enthone, Inc., Dept., M, 442 Elm St., New Haven, Conn.

Elgiloy—Elgin National Watch Co., Elgin, Ill.

Emulsion Type Enamel—Sherwin-Williams Co., General Industrial Div., Cleveland 1, Ohio

Endurion—Rust-Proofing & Metal Finishing Corpn., Cambridge, Mass.

Enthone Compound L-88; Compound 134; Compound NR-31; Descaler 2A—Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn.

EutecRod 115—Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.

Expamet Expanded Aluminum—British Industries Corpn., 164 Duane St., New York 13, N. Y.

Ferrovac-52100—Vacuum Metals Corpn., 70 Memorial Drive, Cambridge 42, Mass.

Flexon—Flexonics Corpn., 1368 S. Third Ave., Maywood, Ill.

Flo—Curran Corpn., Prospect Mills, Lawrence, Mass.

FM—Latrobe Steel Co., Latrobe, Pa.

Fusion Electro-Tin TE-400—Fusion Engineering, 4504 Superior Ave., Cleveland 3, Ohio

Galvanite—Galvanite Corpn., 40 W. 29th St., New York 1, N. Y.

G-E Type W-610-A—General Electric Co., Schenectady 5, N. Y.

Grade X—Micro Metallic Corpn., 35 Sea Cliff Ave., Glen Cove, N. Y.

High-density Metal—Metal Carbides Corpn., 107 E. Indianola Ave., Youngstown, Ohio.

Hollow-Bar Tool Steel—Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

Houghto-Clean 439 and 440—E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Hypertap—Destiny Products Co., 2970 W. Grand Blvd., Detroit 2, Mich.

HZM 100-Harvey Aluminum Div., Harvey Machine Co., Inc., Torrance, Calif.

Imprex—Tincher Products Co., Sycamore, Ill.

J & L "1200" Series—Jones & Laughlin Steel Corpn., Gateway Center, Pittsburgh 30, Pa.

Kanigen—General American Transportation Corpn., 135 LaSalle St., Chicago 90, Ill.

Kelite PWB No. 81 and Spray White—Kelite Products, Inc., 1250 N. Main St., Los Angeles 12, Calif.

Kentanium—Kennametal, Inc., Latrobe, Pa.

Kodagraph Contact Paper Translucent—Eastman Kodak Co., Rochester 4, N. Y.

Kolmetal—Emjay Maintenance Engineers, 327 Union Ave., Rutherford, N. J.

Kralastic—United States Rubber Co., Rockefeller Center, New York 20, N. Y.

L-930 Surface Casting Resin (Metallic)—Rezolin, Inc., 5736 W. 96th St., Los Angeles 45, Calif.

Liquid Adhesive—Cycleweld Products Div. of Chrysler Corpn., Detroit 31, Mich.

Lucoflex—American Lucoflex, Inc., 500 Fifth Ave., New York 18, N. Y.

Lukens Copper-Clad Steels—Lukens Steel Co., Coatesville, Pa.

Lurium L, L5, L10, and L20—Fromson Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.

Lustrex 886—Plastics Div., Monsanto Chemical Co., Springfield, Mass.

Master Universal Fillets—Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio

Metalset (A 101)—Smooth-On Mfg. Co., 572 Communipaw Ave., Jersey City, N. J.

Met-L-Chek Flaw Finder—Met-L-Chek Co., Box 187, 121 N. Prairie Ave., Hawthorne, Calif.

Names and Addresses of Manufacturers of Products Listed

Microstrip—Penn Precision Products, Inc., 501 Crescent Ave., Reading, Pa.

Molynamel—Lubricants Div. of the Lockrey Co., Southampton, N. Y.

Mystik Brand Thin-flex Masking Tape No. 6207—Mystik Adhesive Products, 2635 N. Kildare Ave., Chicago 39, Ill.

Neolag—Main Products Corpn., Dept. 562, 1241 Carpenter St., Philadelphia 47, Pa.

Nerva-Kote Tae—Nerva-Kote Div., Rubber & Plastics Compound Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y.

Nickel-Silver Strip—Industrial Div. of American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

66S—Harvey Aluminum Div., Harvey Machine Co., Inc., Torrance, Calif.

No. 1200—American Platinum Works, Newark 5, N. J.

Oakite Composition Nos. 26, 56, 57, 60, 80-A, 95; Rustripper—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.

OK Wear Strips—Ohio Knife Co., Dreman Ave., Cincinnati 23, Ohio

Olympic FM—Latrobe Steel Co., Latrobe, Pa.

Peel Filmite—DuBois Co., Inc., 1120 W. Front St., Cincinnati 3, Ohio

Pelron No. 560—Pelron Corpn., 7740 W. 47th St., Lyons, Ill.

Polyplastex "MC"—Polyplastex International Corpn., Inc., 441 Madison Ave., New York City

Powdered Stainless Steel—Vanadium-Alloys Steel Co., Latrobe, Pa.

Powrite—Whitfield Chemical Co., Dept. 15-A, 14225 Schaefer Highway, Detroit 27, Mich.

Quick Pik—Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.

Rem-Cru A-110AT—Rem-Cru Titanium, Inc., Midland, Pa.

Reynolds Cast-Aluminum Plate and Bar Stock—Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

Ricwilite 1060 and 7100—Ric-wiL Plastic Coating & Mfg. Corpn., 1290 Euclid Ave., Cleveland 15, Ohio

Rossaul Copper-Brite—Rossaul Co., 170 Fifth Ave., New York 10, N. Y.

Rycut 20 and 40—Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill.

Sanco Hammer Finish—Monroe Sander Corpn., 10-18 46th Ave., Long Island City, N. Y.

Sand Screen—Carborundum Co., Niagara Falls, N. Y.

Shear-Speed Soluble Oil—Shear-Speed Chemical Products Div., Michigan Tool Co., 7125 E. McNichols Road, Detroit 12, Mich.

Shell Alvania Grease; Shell Rimula Oil—Shell Oil Co., 50 W. 50th St., New York 20, N. Y.

Siliconized Witch Oil—Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.

Solo-Phos—Whitfield Chemical Co., 14225 Schaefer Highway, Detroit 27, Mich.

Stain-Alloy—Alloy Metal Powders, Inc., 238 Eagle St., Brooklyn 22, N. Y.

Stainless Steel "48" Soldering Flux—Remont Mfg. Co., Lombard, Ill.

Steel Oilite—Amplex Div., Chrysler Corpn., Detroit 31, Mich.

Steelast—Steelcote Mfg. Co., 3418 Gratiot St., St. Louis, Mo.

Styron 480—Dow Chemical Co., Midland, Mich.

Sunep—Sun Oil Co., Philadelphia 3, Pa.

Sure Grip—Colonial Refining & Chemical Co., National Broadcasting Co. Bldg., Cleveland 14, Ohio

Tamper Proof Sealer EC-1252—Adhesives and Coatings Div., Minnesota Mining & Mfg. Co., 423 Piquette Ave., Detroit 2, Mich.

Tecsolv No. 427—Tect, Inc., Cortlandt and Erie Sts., Dumont, N. J.

Texaco All Temp—Texas Co., 135 E. 42nd St., New York 17, N. Y.

Thin-Gage High-Nickel Alloys—Industrial Div., American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

Thompson Anti-Spatter: No-Clean (SO-327) and Pickle-Off (SO-317)—Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa.

Thred-Gard—Crane Packing Co., Dept. MYN, 1800 Cuyler Ave., Chicago 13, Ill.

Titanium Carbide—Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Titanium Lock-Nuts—Elastic Stop Nut Corpn. of America, Union, N. J.

Titanium Strip and Foil—Industrial Div., American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

Toolplastik L-900 and Toolplastik Gelkote L-910—Rezolin, Inc., 5736 W. 96th St., Los Angeles 45, Calif.

Tungstide—Lockrey Co., Southampton, N. Y.

Type 202—Solar Aircraft Co., 2200 Pacific Highway, San Diego, Calif.

Unionweld—Union Steel Corpn., Union, N. J.

Vantrol 5299M and 5541—Van Straaten Chemical Co., 546 W. Washington Blvd., Chicago 6, Ill.

Vasco 4650-A—Vanadium-Alloys Steel Co., Latrobe, Pa.

Vibraglass—Glass Fibers Inc., 1810 Madison Ave., Toledo, Ohio

Vinsynite FS-3—Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa.

V2B—Cooper Alloy Foundry Co., Hillside, N. J.

Waspaloy—Pratt & Whitney Aircraft Div. of United Aircraft Corpn., East Hartford 8, Conn.

ZeVeScal—Calumet Steel Castings Corpn., 1636 Summer St., Hammond, Ind.

ZRC—Sealube Co., Wakefield, Mass.

Obtaining Maximum Efficiency from Multiple Tooling

Complete coordination of many factors is essential to obtain optimum efficiency and reduce waste in applications of multiple tooling. Abstract of a technical paper presented before a recent meeting of the Carbide Section, American Society of Tool Engineers

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MULTIPLE tooling—by means of which many operations can be performed simultaneously with a minimum of work-handling—is contributing more and more toward the attainment of maximum efficiency in the utilization of manpower, machines, and plant facilities at the Ford Motor Co., as well as many other manufacturing concerns. With great strides being made toward complete automation and the push-button factory, multiple tooling is rapidly becoming a competitive and economic necessity.

The successful application of multiple tooling, however, involves many factors and requires the complete coordination of different departments. For example, factors affecting the efficiency and economy of such applications include processing of the work, and the design, usage, and reconditioning of the tools.

Of primary importance is the type of tools selected to manufacture a part. This should be determined at the processing stage of production planning. If maximum efficiency is to be obtained from the tools and machines, it is essential that they be selected only after careful analysis has been made of the part to be machined. In this analysis, design features of the part that will be detrimental to economical production methods

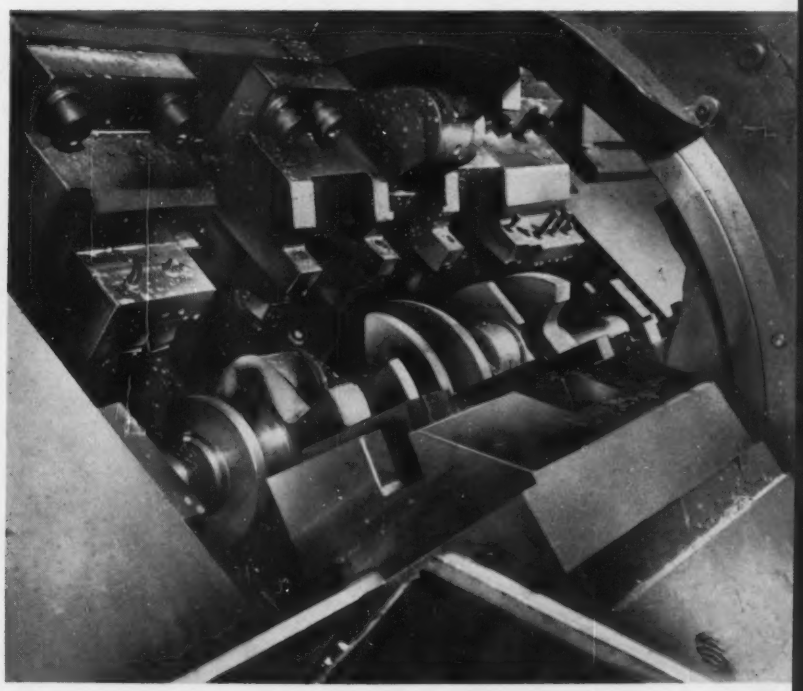


Fig. 1. Analysis of the six-cylinder crankshaft resulted in supporting and driving the shaft at its center. Ends are supported by centers.

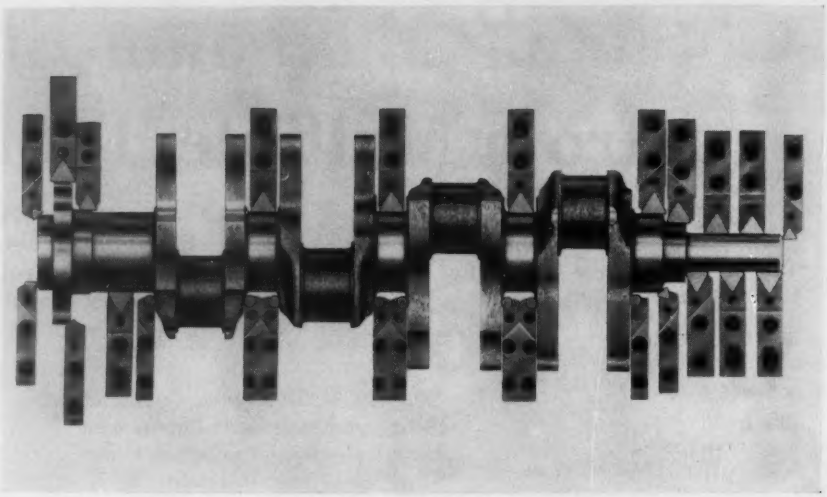


Fig. 2. Schematic drawing of multiple tooling set-up for crankshafts illustrating the use of twenty-six carbide tools for facing, turning, and chamfering

should be changed or eliminated wherever possible. Surfaces to be machined, amounts of stock to be removed, sequence of operations, locating and clamping surfaces, and dimensional requirements should be determined and noted on the processing sheet. Machinability of the workpiece, hourly production requirements, and anticipated model life of the product in which the part will be used should be considered in selecting proper tools, fixtures, and machines, and optimum speeds and feeds.

For example, in turning the main bearings and ends of the Ford six-cylinder crankshaft, an analysis of the shaft indicated that to provide adequate tooling area it would be necessary to support and drive at the center, with ends supported by centers, as shown in Fig. 1. The crankshaft is clamped and driven through its center cheeks by means of a rugged drive contained in a large bearing (part of which can be seen at the upper right). Ample clearance has been provided to facilitate loading of the part.

In multiple tooling applications, it is important that proper tool lay-outs be prepared before procuring standard tools or designing and fabricating special tools. A schematic drawing of the multiple tooling set-up for crankshafts is seen in Fig. 2. Complete tool lay-outs should

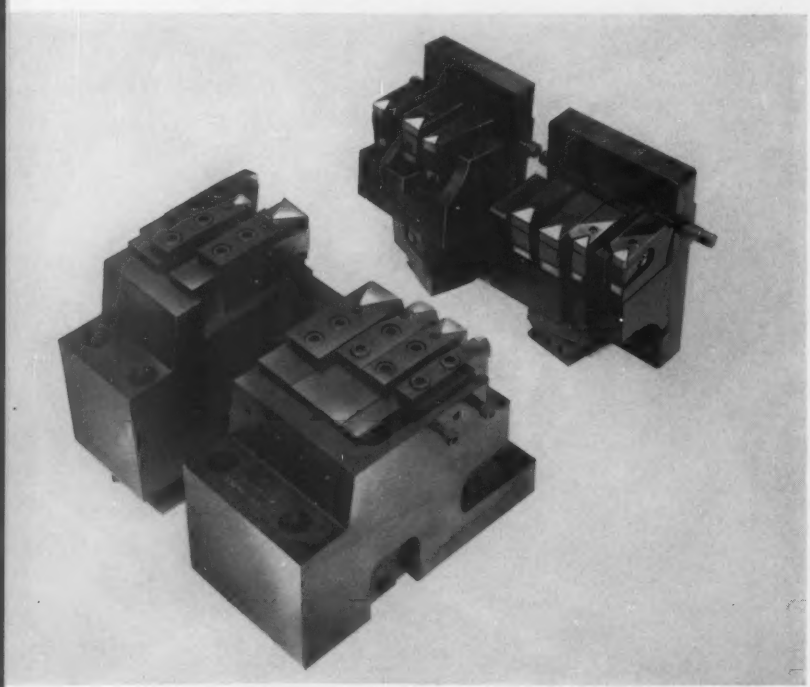


Fig. 3. Rigidity and accuracy are essential for successful multiple-tooling applications. Here are tool-blocks and toolholders for facing and turning main bearings of six-cylinder crankshafts.

clearly indicate (1) the type and design of all tools, adapters, guides, and holders required for each operation; (2) the relative positions of all these elements; (3) requirements for the driving units; (4) the cycle of the machine; and (5) speeds and feeds to be employed. Such lay-outs make it possible to anticipate machining difficulties and, in the majority of cases, minimize tool troubles.

Tool lay-outs also make it possible to visualize the feasibility of using pre-set tools, whether ample provisions have been made for changing tools rapidly and safely, the clearances for chip disposal, and whether coolants can be applied where needed. An important benefit is that the lay-outs will indicate which applications permit the use of standard tools and which require special tooling.

Standard tools should be specified whenever practicable. With the application of such tools, benefits derived from quantity buying, minimum inventory, availability, interchangeability, safety, and minimum "down" time for maintenance can be achieved. When the requirements of the design are such that standard tools cannot be applied, modified standard tools should be considered. Special tools should be specified only when standard or commercially available tools cannot adequately do the job. The shape, dimensions, accuracy, strength, rigidity, construction, material, heat-treatment, and surface finish of a tool should be determined at the tool design stage. Tool drawings should be made only after the tool lay-out has been prepared and approved by all concerned.

Careful application and design of multiple tools must be followed by conscientious usage, handling, and reconditioning of the tools by trained personnel. This is particularly true when tools are run beyond a certain wear point. In such cases, especially in carbide applications, the resulting wear will generally be many times greater than normal with only a relatively small amount of production gained. To prevent this abuse, certain preventive measures should be taken.

First, either a tool change cycle or an optimum wear point should be established for those applications in which it is practical to do so. Tool change cycles should be predicated on such factors as the rate of tool wear, the value and quantity of tools used, regrinding and reconditioning costs, the accuracy and finish requirements of the work-piece, machine "down" time required for tool changes and set-up, and the possible consequences of tool failure. Optimum wear points should also be based on these factors, as well as on the wear standards applicable to the type of tool used. Tool change cycles or optimum wear points should also be adjusted to coincide with scheduled production time, and to agree with the change cycles of other tools related to the operation.

After establishing the tool change cycle, methods of control must be initiated. Control may be achieved mechanically by means of

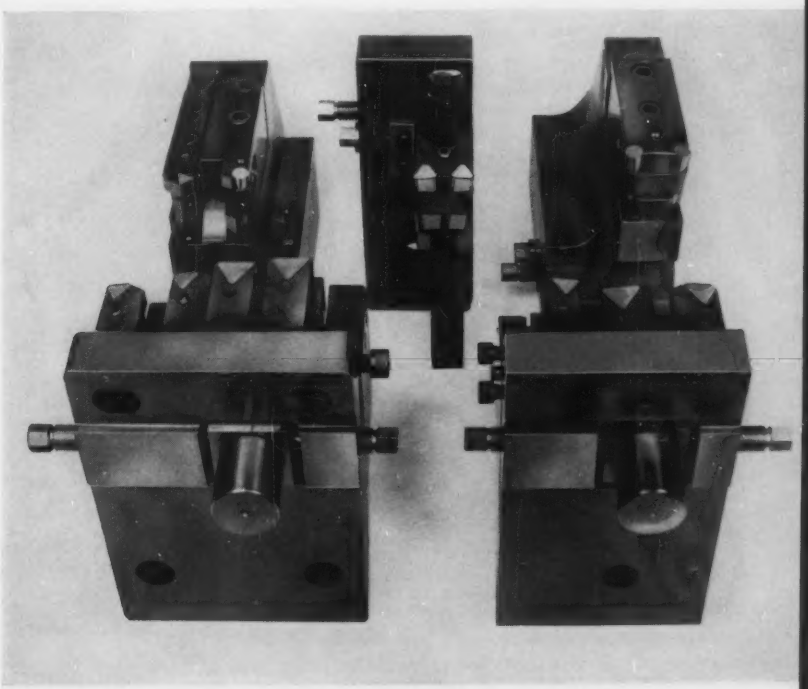


Fig. 4. Additional blocks and holders employed in machining crankshafts. Axial location of the blocks can be altered by adjusting the set-screws provided on both sides of each block.

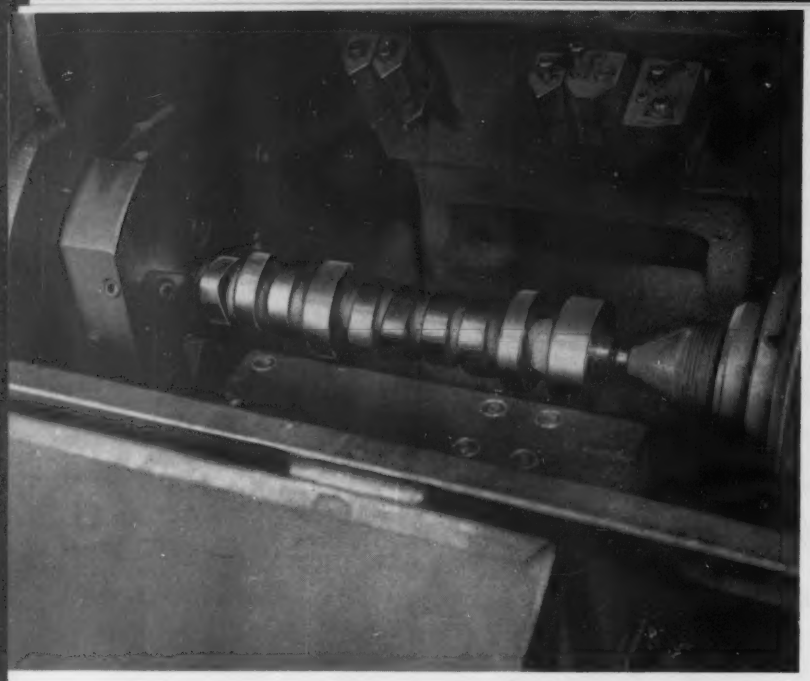


Fig. 5. Rigid support is provided in turning and chamfering camshafts on this lathe by means of an automatic driver and tailstock center.

counters or other machine attachments which will indicate by some signal that the cycle has been completed and the tool should be changed.

The importance of minimizing machine "down" time for changing tools has increased with the greater use of multiple-station machines and transfer type machines. Because of these developments, stopping a machine to change a tool may mean interruption of a portion or all of the productive capacity on the line. In order to minimize "down" time and prevent possible consequences of tool failure, it has been found necessary at Ford to adopt systematic tool change methods. Tool change cycles have been established and tools are now changed regularly, consistent with normal production schedules and before excessive wear or failure occurs.

The time required for changing and adjusting tools should be held to a minimum. At the tool design stage, tool-holders and accessories should be so designed that tools can be pre-set to the required length or size outside of the machine, or tool replacement made without disturbing

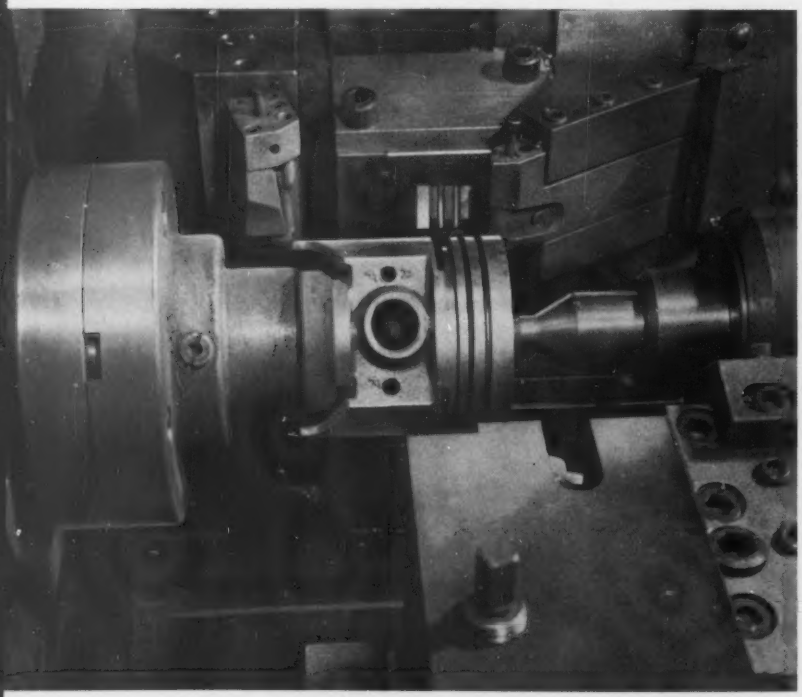


Fig. 6. Pistons are positively located and internally clamped by an expanding mandrel. A tailstock center supports dome end of the piston.

the relation of the tool to the production part. When necessary, setting gages should be provided to facilitate the replacement and adjustment of the tool.

Many of these features and advantages are incorporated in the basic design of several commercially available tools. In drilling and reaming operations, adjustable adapters may be provided to permit pre-setting such tools to the proper length. Spot-facing, counterboring, and milling tools may incorporate in their design quick-change features.

In turning and facing operations, ejector type tools are used whenever possible, superseding the single cutting edge tools. The use of this type of tool enables the machine operator or set-up man to rapidly index the tool and present a new cutting edge to the work.

Ejector type tool-holders employed for facing and turning the main bearings and ends of Ford six-cylinder crankshafts are shown in their respective holders in Figs. 3 and 4. Since the carbide inserts can be quickly indexed without disturbing their relation to the work-piece, the holders are rigidly bolted to the blocks. Axial location of the blocks can be altered when necessary by adjusting the set-screws provided on the sides of the blocks. Angular relation of the blocks to the work-piece is established by means of horizontal keys on the mounting faces.

The methods and practices employed in grinding will directly affect the quality and efficiency of a cutting tool. In order to maintain the desired cutting characteristics, the reground tool should be inspected after grinding. When inspection reveals an improper grind, the grinding department should be notified so that correction will be made. Proper handling of the tools, especially carbide tools, is also important, since carbide will chip and crack readily when mishandled.

The efficiency with which multiple tooling may be applied depends largely upon the number of tools that can be engaged simultaneously, and the equality with which the work may be divided among them. Of primary importance are tool-holder requirements, design and application of tools, and methods of holding and locating the part. The requirements for tool-holders and tool-blocks are rigidity, accuracy, and adjustability. Long tool life must be provided in order that the production time loss due to tool changes is minimized. This requires that the design of the tool be kept as simple as possible. Carbides should be used wherever practicable.

Because tool pressures are usually high in multiple tooling, firm support must be provided for the production part to eliminate distortion and reduce vibration under the cutting force applied. While providing adequate support, it is also necessary to allow sufficient space for strength, rigidity, and accessibility to tools and tool-blocks, and provide for loading and unloading of the part with relative ease.

The support and automatic driving mechanism provided for a long, slender part are illustrated in Fig. 5. Here, the camshaft bearing surfaces are being turned and chamfered on an automatic lathe. Ample space has been provided for loading and unloading the work-piece. Positive positioning and internal clamping are obtained by means of an expanding mandrel in turning the skirt, ring grooves, and dome of a piston on another automatic lathe, Fig. 6. Additional support is provided by means of a center on the dome end of the piston.

Finally, there is the necessity for educational programs to fully acquaint all personnel connected with tool usage of the advantages and economy of good tool practices. Through sound engineering practices in design and tool usage, and continued educational programs, manufacturing is constantly improving its productive capacity and efficiency. At the present rate of utilization of automatic processes with transfer type machines, the "push-button" plant with completely automated production will, in the not too distant future, become a reality.

* * *

Brightening of High-Purity Aluminum

A new German-developed electrochemical process, which produces a permanently brilliant surface finish on metal parts made of Lurium—high-purity aluminum introduced into the United States last year by the Fromson Orban Co., Inc., New York City—is now being licensed by the company to metal-working and finishing plants. The first license for the Lurbrite finishing process has been issued to the Custom Plating Co., Providence, R. I.

The Lurbrite process, which was developed by Langbein-Pfanhauser Werke A.G., and is in commercial use in Germany and England, consists of common and relatively inexpensive chemicals. The time required for the brightening process is only thirty to sixty seconds.

* * *

It takes more than 3,000,000 feet of copper in copper-shielded wire, together with approximately 2 miles of coaxial cable, to properly equip a modern television broadcasting station.

Span Measurement of Involute Gear Teeth

An important paper read before the American Gear Manufacturers Association and presented exclusively in comprehensive form—Second Installment

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FORMULAS for span measurement of spur and helical gears were presented in September MACHINERY. To facilitate span measurement calculations, tables of involute and trigonometric functions are provided here, along with worked out examples showing the use of the formulas and tables. In addition, formulas for Fellows and Sykes transverse diametral pitch gears are given.

Examples Showing Application of the Formulas

Example 1—Compute the span dimension for the following standard helical gear:

$N = 31$
$P_n = 9$
$\phi_n = 20°$
$\psi = 19°55'11''$ LH
$p_n = 0.3490659$

0.002 = to 0.003-inch tooth-thickness reduction, normal, for backlash

Step 1. Use Formula (3) or the alignment chart (Fig. 6, September MACHINERY) to find S:

$$S = \frac{31 \times 20}{180 \times 0.940 \times 0.940} = 3.9, \text{ rounded up to } 4.5$$

Step 2. Interpolate from Table 3 to find inv $\phi_t = 0.0177677$

Step 3. Calculate M_1 from Formula (4):

$$M_1 = 0.9396926\left(\frac{3.1415927 \times 4.5 + 31 \times 0.0177677}{9}\right)$$
$$= 1.5336 \text{ inches}$$

Step 4. Allow for backlash and set limits:

$$1.5336 \begin{matrix} -.002 \\ -.003 \end{matrix} = \frac{1.5316}{1.5306}$$

Example 2—Compute the span dimensions for the following pair of long- and short-addendum gears operating at standard center distances:

$N_P = 17$	$N_G = 114$
$P_n = 6$	$P_n = 6$
$\phi_n = 14\frac{1}{2}°$	$\phi_n = 14\frac{1}{2}°$
$\psi = 7°30'$ RH	$\psi = 7°30'$ LH
$p_n = 0.5235988$	$p_n = 0.5235988$
$\Delta D = +0.1667$	$\Delta D = -0.1667$

Backlash, assembled = 0.006 to 0.010 inch, normal

Step 1. Use Formula (3) to find S:

$$S \text{ (pinion)} = \frac{17 \times 14.5}{180 \times 0.991 \times 0.991}$$
$$= 1.4, \text{ rounded up to } 1.5$$

$$S \text{ (gear)} = \frac{114 \times 14.5}{180 \times 0.991 \times 0.991}$$
$$= 9.3, \text{ rounded up to } 9.5$$

Step 2. From Table 3, determine inv $\phi_t = 0.0056859$

Step 3. Calculate M_2 from Formula (5)

$$M_2 \text{ (pinion)} = 0.9681476\left(\frac{3.1415927 \times 1.5 + 17 \times 0.0056859}{6} + 0.1667 \times 0.2586176\right)$$
$$= 0.8177 \text{ inch}$$

$$M_2 \text{ (gear)} = 0.9681476\left(\frac{3.1415927 \times 9.5 + 114 \times 0.0056859}{6} - 0.1667 \times 0.2586176\right)$$
$$= 4.8788 \text{ inches}$$

Step 4. Allow for backlash and set limits:

$$0.8177 \begin{matrix} -.003 \\ -.005 \end{matrix} = \frac{0.8143}{0.8123} \text{ (pinion)}$$

$$4.8788 \begin{matrix} -.003 \\ -.005 \end{matrix} = \frac{4.8758}{4.8738} \text{ (gear)}$$

Example 3—The pinion in the previous example may be modified by cutting 16 teeth into the 17-tooth pinion blank, and then operated in the same assembly. Compute the span dimensions for such a pinion. Note that this now becomes a case of non-standard center-distance operation wherein a pinion is enlarged more than the mating gear is decreased. The span dimension of the gear is unchanged from the previous example. The pinion span dimension is obtained from Formula (8).

The specifications are as follows:

$N_P = 16$	$N_G = 114$
$P_n = 6$	$P_n = 6$
$\phi_n = 14\frac{1}{2}°$	$\phi_n = 14\frac{1}{2}°$
$\psi = 7°30'$ RH	$\psi = 7°30'$ LH
$p_n = 0.5235988$	$p_n = 0.5235988$
$D = 2.689677$	$D = 19.16395$
$\Delta D_P = +0.3351$	$\Delta D_G = -0.1667$

$C = 10.9268$
$C_k = 11.011$

Backlash, assembled = 0.006 to 0.010 inch, normal

Step 1. Use Formula (3) or the alignment chart (Fig. 6, September MACHINERY) to find S:

$$S = \frac{16 \times 14.5}{180 \times 0.991 \times 0.991} = 1.3, \text{ rounded up to } 1.5$$

Step 2. From Table 3, determine inv $\phi_t = 0.0056859$
Also determine cos $\phi_t = 0.9676221$

Step 3. Use Formula (2) and Table 3 to determine inv ϕ_k

$$\phi_k = \text{arc cos}\left(\frac{C \cos \phi_t}{C_k}\right) = \text{arc cos}\,\frac{10.9268 \times 0.9676221}{11.011}$$
$$= \text{arc cos}\ 0.9602227$$

Interpolating from Table 3:
inv ϕ_k = inv arc cos 0.9602227 = 0.0078050

Step 4. Use Formula (8) to calculate M_P

$$M_P = 0.9681476\left(\frac{3.1415927 \times 1.5 + (114 + 16)\,0.0078050}{6} - \frac{114 \times 0.0056859}{6} - (-0.1667)\,0.2586167\right)$$
$$= 0.8613$$

Step 5. Allow for backlash and set limits:

$$0.8613 \begin{matrix} -.003 \\ -.005 \end{matrix} = \begin{matrix} 0.8583 \\ 0.8563 \end{matrix}$$

The formulas thus far given are used to obtain span dimensions of helical gears of normal diametral pitch. Most of these gears are cut by the hobbing process, which permits a choice of an almost unlimited number of helix angles. It is common practice among designers to adjust helix angles after the normal diametral pitch and numbers of teeth in mating gears have been decided upon so that the gears can be operated at some previously selected nominal center distance. While hobbed helical gears are made to every conceivable helix angle—some differing by as little as a fraction of a minute from another gear—it is relatively rare that hobbed gears are operated at non-standard center distances.

Helical gears produced by the shaping process are often made using *transverse diametral pitch* cutters rather than normal diametral pitch cutters. The helix angle is usually selected from a preferred series of angles for which helical guides are available. Since the designer does not have free option to adjust the helix angle of shaped gears, they often operate at enlarged or decreased center distances. It is therefore necessary to use modified forms of the span dimension formulas previously given for transverse diametral pitch gears, particularly those operating at non-standard center distances.

Number of Teeth to be Included Within the Span of the Caliper

The formula for the number of pitches to be included in the span measurement for the transverse diametral pitch system is as follows:

$$S = \frac{N \phi_t}{180 \cos \psi} \qquad (11)$$

Span Dimensions for Standard Transverse Diametral Pitch Gears

The span dimension of standard transverse diametral pitch gears meshing at standard center distances can be found from the following formula, in which P_t is the transverse diametral pitch:

$$M_{1(0)} = \cos \phi_n \cos \psi \left(\frac{\pi S + N \text{ inv } \phi_t}{P_t}\right) \qquad (12)$$

Span Dimensions for Long- and Short-Addendum Transverse Diametral Pitch Gears

Span dimensions of long- and short-addendum gears operating at standard center distances can be found from the following formula:

$$M_{2(0)} = \cos \phi_n \cos \psi \left(\frac{\pi S + N \text{ inv } \phi_t}{P_t} + \Delta D \tan \phi_t\right) \qquad (13)$$

Span Dimensions for Non-Standard Center Distance Operation, Transverse Diametral Pitch Gears

Mating Gears Proportionately Modified—When mating gears are each enlarged or decreased in direct proportion to the number of teeth in each, the span dimension can be found from the following formula:

$$M_{3(0)} = \cos \phi_n \cos \psi \left(\frac{\pi S + N \text{ inv } \phi_k}{P_t}\right) \qquad (14)$$

Only One Gear Modified—When one gear is modified and mated with a standard gear at non-standard center distance, the span dimension for the modified gear can be found from the following formula, in which N_G refers to the modified gear and N_P refers to the unmodified mate regardless of gear size or ratio:

$$M_{4(0)} = \cos \phi_n \cos \psi \left(\frac{\pi S + (N_G + N_P) \text{ inv } \phi_k - N_P \text{ inv } \phi_t}{P_t}\right) \qquad (15)$$

Mating Gears Disproportionately Modified—When each of two mating gears are arbitrarily enlarged or decreased without consideration of the gear ratio and the gears are then run at non-standard center distance, it is customary to designate one of the gears as the pinion and increase the thickness of this pinion by the amount of backlash correction for non-standard center distance operation. The span dimension formula for the *gear only* is the same as that for a long- or short-addendum gear. The span dimension for the *pinion only* can be found from the following formula:

$$M_P = \cos \phi_n \cos \psi \left(\frac{\pi S + (N_G + N_P) \text{ inv } \phi_k - N_G \text{ inv } \phi_t}{P_t} - \Delta D_G \tan \phi_t\right) \qquad (16)$$

Table 3. Involute and Trigonometric Functions of the Transverse Pressure Angle for Helical Gears of 14 1/2- and 20-Degree Normal Pressure Angle

Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t			Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t		
		inv ϕ_t	sin ϕ_t	cos ϕ_t			inv ϕ_t	sin ϕ_t	cos ϕ_t
14 1/2-DEGREE NORMAL PRESSURE ANGLE									
0°	14.5000	.0055448	.2503800	.9681476	15°	14.9888	.0061358	.2586311	.9659762
0°15′	5001	55450	03822	81471	15°15′	15.0057	61570	89158	58999
0°30′	5005	55455	03889	81453	15°30′	0229	61786	92058	58221
0°45′	5012	55462	04001	81424	15°45′	0405	62006	95010	57428
1°	14.5021	.0055473	.2504157	.9681384	16°	15.0583	.0062231	.2598015	.9656621
1°15′	5033	55487	04359	81332	16°15′	0764	62461	.2601072	55797
1°30′	5048	55504	04604	81268	16°30′	0949	62695	04183	54959
1°45′	5065	55524	04895	81193	16°45′	1137	62934	07347	54105
2°	14.5085	.0055547	.2505230	.9681106	17°	15.1328	.0063177	.2610566	.9653235
2°15′	5107	55574	05611	81008	17°15′	1522	63425	13838	52350
2°30′	5132	55603	06036	80898	17°30′	1719	63679	17165	51448
2°45′	5160	55636	06505	80776	17°45′	1920	63937	20546	50531
3°	14.5191	.0055671	.2507020	.9680643	18°	15.2124	.0064199	.2623982	.9649597
3°15′	5224	55710	07580	80498	18°15′	2331	64467	27474	48647
3°30′	5260	55752	08185	80341	18°30′	2542	64741	31021	47680
3°45′	5298	55797	08835	80173	18°45′	2756	65019	34625	46697
4°	14.5339	.0055845	.2509529	.9679993	19°	15.2973	.0065302	.2638284	.9645696
4°15′	5383	55897	10270	79801	19°15′	3194	65591	42000	44679
4°30′	5429	55951	11055	79597	19°30′	3418	65885	45774	43645
4°45′	5479	56009	11885	79382	19°45′	3646	66184	49604	42593
5°	14.5530	.0056070	.2512761	.9679154	20°	15.3877	.0066489	.2653493	.9641524
5°15′	5585	56134	13683	78915	20°15′	4111	66800	57439	40437
5°30′	5642	56202	14650	78664	20°30′	4350	67116	61444	39332
5°45′	5702	56272	15662	78401	20°45′	4591	67438	65508	38209
6°	14.5765	.0056346	.2516720	.9678126	21°	15.4836	.0067766	.2669631	.9637068
6°15′	5830	56423	17824	77839	21°15′	5085	68099	73814	35908
6°30′	5898	56504	18974	77539	21°30′	5337	68439	78056	34730
6°45′	5969	56588	20170	77228	21°45′	5593	68785	82359	33533
7°	14.6043	.0056675	.2521412	.9676905	22°	15.5853	.0069137	.2686723	.9632316
7°15′	6119	56765	22700	76569	22°15′	6116	69495	91148	31081
7°30′	6198	56859	24034	76221	22°30′	6383	69859	95635	29826
7°45′	6280	56956	25415	75861	22°45′	6654	70230	.2700184	28552
8°	14.6364	.0057057	.2526842	.9675488	23°	15.6928	.0070607	.2704796	.9627257
8°15′	6451	57160	28316	75103	23°15′	7206	70991	09471	25942
8°30′	6541	57268	29837	74705	23°30′	7488	71382	14209	24608
8°45′	6634	57379	31404	74295	23°45′	7774	71780	19011	23252
9°	14.6730	.0057493	.2533019	.9674873	24°	15.8064	.0072184	.2723878	.9621876
9°15′	6828	57611	34681	73437	24°15′	8357	72596	28809	20478
9°30′	6930	57732	36390	72989	24°30′	8655	73014	33806	19059
9°45′	7034	57857	38147	72529	24°45′	8957	73441	38869	17619
10°	14.7140	.0057986	.2539951	.9672055	25°	15.9263	.0073874	.2743999	.9616157
10°15′	7250	58118	41803	71569	25°15′	9572	74315	49195	14673
10°30′	7363	58254	43703	71069	25°30′	9886	74763	54459	13166
10°45′	7478	58393	45651	70556	25°45′	16.0204	75220	59790	11637
11°	14.7596	.0058536	.2547647	.9670031	26°	16.0526	.0075684	.2765191	.9610084
11°15′	7718	58683	49692	69492	26°15′	0852	76156	70660	08509
11°30′	7842	58834	51786	68940	26°30′	1182	76637	76199	06910
11°45′	7969	58989	53928	68374	26°45′	1516	77125	81808	05287
12°	14.8098	.0059147	.2556119	.9667795	27°	16.1855	.0077623	.2787488	.9603640
12°15′	8231	59309	58360	67202	27°15′	2199	78128	93240	01969
12°30′	8367	59475	60649	66596	27°30′	2546	78643	99063	00273
12°45′	8506	59645	62989	65976	27°45′	2898	79166	.2804959	.9598552
13°	14.8647	.0059819	.2565378	.9665342	28°	16.3254	.0079698	.2810929	.9596806
13°15′	8792	59997	67817	64694	28°15′	3615	80240	16972	95034
13°30′	8939	60179	70306	64033	28°30′	3981	80791	23089	93235
13°45′	9090	60365	72846	63357	28°45′	4350	81351	29282	91411
14°	14.9244	.0060555	.2575437	.9662667	29°	16.4725	.0081921	.2835551	.9589560
14°15′	9400	60750	78078	61962	29°15′	5104	82501	41896	87681
14°30′	9560	60948	80771	61243	29°30′	5488	83091	48318	85775
14°45′	9723	61151	83515	60510	29°45′	5877	83692	54818	83841

Table 3 *(Continued)*. Involute and Trigonometric Functions of the Transverse Pressure Angle for Helical Gears of 14 1/2- and 20-Degree Normal Pressure Angle

Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t			Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t		
		inv ϕ_t	sin ϕ_t	cos ϕ_t			inv ϕ_t	sin ϕ_t	cos ϕ_t
14 1/2-DEGREE NORMAL PRESSURE ANGLE									
30°	16.6270	.0084302	.2861397	.9581879	38°	18.1693	.0110756	.3118265	.9501391
30°15′	6668	84924	68055	79888	38°15′	2276	11854	27917	.9498218
30°30′	7071	85556	74793	77869	38°30′	2864	12973	37679	94997
30°45′	7479	86199	81611	75819	38°45′	3460	14113	47553	91729
31°	16.7892	.0086853	.2888511	.9573740	39°	18.4063	.0115274	.3157541	.9488411
31°15′	8310	87519	95494	71631	39°15′	4674	16457	67642	85043
31°30′	8733	88196	.2902559	69491	39°30′	5291	17663	77860	81625
31°45′	9161	88885	09708	67319	39°45′	5915	18892	88195	78155
32°	16.9594	.0089587	.2916942	.9565116	40°	18.6547	.0120145	.3198648	.9474632
32°15′	17.0033	90300	24261	62881	40°15′	7187	21422	.3209221	71056
32°30′	0476	91026	31667	60613	40°30′	7834	22723	19915	67426
32°45′	0925	91766	39159	58313	40°45′	8489	24050	30732	63740
33°	17.1380	.0092518	.2946740	.9555978	41°	18.9151	.0125403	.3241673	.9459998
33°15′	1840	93283	54409	53610	41°15′	9822	26782	52740	56198
33°30′	2305	94062	62168	51207	41°30′	19.0500	28188	63933	52340
33°45′	2776	94855	70018	48769	41°45′	1187	29622	75255	48423
34°	17.3253	.0095662	.2977959	.9546296	42°	19.1881	.0131085	.3286708	.9444446
34°15′	3735	96484	85993	43786	42°15′	2584	32577	98291	40406
34°30′	4223	97320	94119	41239	42°30′	3295	34098	.3310009	36305
34°45′	4717	98171	.3002341	38656	42°45′	4015	35650	21860	32139
35°	17.5216	.0099037	.3010657	.9536034	43°	19.4744	.0137233	.3333849	.9427908
35°15′	5722	99920	19070	33374	43°15′	5481	38849	45976	23611
35°30′	6233	.0100818	27580	30675	43°30′	6227	40497	58242	19247
35°45′	6751	01732	36189	27936	43°45′	6982	42179	70650	14814
36°	17.7275	.0102663	.3044896	.9525157	44°	19.7746	.0143895	.3383202	.9410311
36°15′	7805	03611	53705	22336	44°15′	8519	45647	95899	05736
36°30′	8341	04577	62614	19475	44°30′	9301	47435	.3408742	01089
36°45′	8883	05560	71627	16570	44°45′	20.0093	49260	21735	.9396368
37°	17.9432	.0106562	.3080742	.9513623	45°	20.0895	.0151124	.3434878	.9391571
37°15′	9988	07581	89963	10632					
37°30′	18.0549	08620	99290	07597					
37°45′	1118	09678	.3108723	04517					
20-DEGREE NORMAL PRESSURE ANGLE									
0°	20.0000	.0149044	.3420201	.9396926	8°	20.1808	.0153265	.3449831	.9386089
0°15′	0002	49048	20230	96916	8°15′	1923	53537	51724	85393
0°30′	0007	49060	20316	96884	8°30′	2042	53819	53678	84674
0°45′	0016	49080	20460	96832	8°45′	2165	54110	55691	83933
1°	20.0028	.0149109	.3420661	.9396759	9°	20.2292	.0154410	.3457765	.9383169
1°15′	0044	49145	20920	96664	9°15′	2422	54719	59899	82382
1°30′	0063	49190	21237	96549	9°30′	2556	55037	62094	81573
1°45′	0086	49243	21611	96413	9°45′	2694	55365	64349	80740
2°	20.0112	.0149304	.3422042	.9396256	10°	20.2836	.0155702	.3466665	.9379884
2°15′	0142	49373	22531	96078	10°15′	2981	56048	69042	79006
2°30′	0175	49450	23078	95879	10°30′	3130	56404	71481	78103
2°45′	0212	49535	23683	95658	10°45′	3283	56770	73980	77178
3°	20.0253	.0149629	.3424345	.9395417	11°	20.3439	.0157145	.3476542	.9376228
3°15′	0297	49731	25065	95155	11°15′	3599	57530	79165	75255
3°30′	0344	49841	25843	94871	11°30′	3763	57925	81850	74258
3°45′	0395	49959	26679	94566	11°45′	3931	58329	84598	73237
4°	20.0450	.0150086	.3427573	.9394240	12°	20.4103	.0158744	.3487407	.9372192
4°15′	0508	50221	28525	93892	12°15′	4279	59169	90280	71123
4°30′	0569	50364	29535	93524	12°30′	4458	59604	93215	70029
4°45′	0634	50516	30603	93134	12°45′	4642	60049	96213	68911
5°	20.0703	.0150676	.3431730	.9392722	13°	20.4829	.0160505	.3499275	.9367768
5°15′	0775	50844	32915	92289	13°15′	5020	60971	.3502400	66600
5°30′	0851	51021	34158	91835	13°30′	5215	61447	05589	65407
5°45′	0931	51207	35460	91358	13°45′	5414	61934	08842	64189
6°	20.1014	.0151401	.3436821	.9390861	14°	20.5617	.0162432	.3512159	.9362945
6°15′	1100	51603	38240	90341	14°15′	5824	62941	15541	61676
6°30′	1190	51814	39718	89800	14°30′	6035	63461	18988	60381
6°45′	1284	52034	41256	89236	14°45′	6250	63992	22499	59060
7°	20.1382	.0152263	.3442852	.9388651	15°	20.6469	.0164534	.3526077	.9357712
7°15′	1483	52500	44508	88044	15°15′	6692	65087	29718	56339
7°30′	1587	52746	46222	87415	15°30′	6919	65652	33428	54939
7°45′	1696	53001	47997	86763	15°45′	7150	66229	37203	53512

Table 3 *(Continued)*. Involute and Trigonometric Functions of the Transverse Pressure Angle for Helical Gears of 14 1/2- and 20-Degree Normal Pressure Angle

Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t			Helix Angle, ψ	Transverse Pressure Angle, ϕ_t	Functions of the Transverse Pressure Angle ϕ_t		
		inv ϕ_t	sin ϕ_t	cos ϕ_t			inv ϕ_t	sin ϕ_t	cos ϕ_t
20-DEGREE NORMAL PRESSURE ANGLE									
16°	20.7386	.0166817	.3541045	.9352059	31°	23.0073	.0230712	.3908442	.9204568
16°15′	7625	67417	44953	50578	31°15′	0614	32427	17173	00856
16°30′	7869	68029	48929	49070	31°30′	1164	34172	26003	.9197092
16°45′	8117	68653	52972	47534	31°45′	1720	35946	34932	93275
17°	20.8369	.0169289	.3557083	.9345970	32°	23.2283	.0237751	.3943962	.9189405
17°15′	8625	69938	61261	44379	32°15′	2853	39587	53094	85480
17°30′	8885	70599	65509	42759	32°30′	3429	41454	62327	81501
17°45′	9150	71273	69825	41111	32°45′	4012	43354	71664	77466
18°	20.9419	.0171959	.3574210	.9339434	33°	23.4601	.0245286	.3981105	.9173375
18°15′	9692	72659	78665	37728	33°15′	5197	47252	90650	69226
18°30′	9970	73372	83189	35992	33°30′	5801	49252	.4000301	65020
18°45′	21.0252	74098	87784	34228	33°45′	6411	51287	10059	60755
19°	21.0538	.0174837	.3592450	.9332433	34°	23.7028	.0253357	.4019924	.9156430
19°15′	0829	75591	97186	30608	34°15′	7652	55463	29897	52045
19°30′	1124	76358	.3601994	28754	34°30′	8284	57606	39980	47599
19°45′	1424	77139	06873	26868	34°45′	8922	59786	50173	43090
20°	21.1728	.0177934	.3611825	.9324952	35°	23.9568	.0262005	.4060478	.9138518
20°15′	2037	78744	16849	23004	35°15′	24.0221	64263	70894	33883
20°30′	2350	79568	21946	21025	35°30′	0882	66561	81424	29183
20°45′	2668	80407	27116	19014	35°45′	1550	68899	92068	24417
21°	21.2991	.0181261	.3632360	.9316977	36°	24.2226	.0271279	.4102827	.9119584
21°15′	3318	82130	37679	14896	36°15′	2909	73701	13703	14683
21°30′	3649	83015	43072	12789	36°30′	3601	76166	24695	09714
21°45′	3986	83915	48540	10648	36°45′	4300	78675	35806	04675
22°	21.4327	.0184831	.3654083	.9308473	37°	24.5007	.0281230	.4147037	.9099565
22°15′	4673	85763	59703	06265	37°15′	5721	83830	58388	94384
22°30′	5024	86712	65399	04023	37°30′	6444	86477	69860	89129
22°45′	5379	87676	71173	01747	37°45′	7176	89172	81455	83801
23°	21.5740	.0188658	.3677023	.9299436	38°	24.7915	.0291916	.4193174	.9078397
23°15′	6105	89657	82952	97089	38°15′	8663	94709	.4205018	72917
23°30′	6475	90673	88959	94707	38°30′	9419	97554	16988	67360
23°45′	6851	91706	95045	92290	38°45′	25.0183	.0330451	29085	61724
24°	21.7231	.0192758	.3701210	.9289836	39°	25.0957	.0303400	.4241311	.9056008
24°15′	7616	93827	07455	87345	39°15′	1739	06404	53666	50211
24°30′	8006	94915	13781	84817	39°30′	2529	09464	66152	44332
24°45′	8402	96021	20188	82252	39°45′	3329	12581	78770	38370
25°	21.8802	.0197146	.3726676	.9279649	40°	25.4138	.0315755	.4291522	.9032322
25°15′	9208	98291	33247	77007	40°15′	4955	18989	.4304408	26188
25°30′	9619	99455	39900	74327	40°30′	5782	22283	17430	19967
25°45′	22.0035	.0200638	46637	71608	40°45′	6618	25639	30589	13656
26°	22.0547	.0201842	.3753457	.9268849	41°	25.7464	.0329058	.4343887	.9007255
26°15′	0884	03067	60362	66050	41°15′	8319	32543	57324	00763
26°30′	1316	04312	67353	63210	41°30′	9184	36093	70903	.8994177
26°45′	1754	05579	74427	60329	41°45′	26.0058	39711	84624	87496
27°	22.2197	.0206866	.3781589	.9257407	42	26.0942	.0343399	.4398489	.8980718
27°15′	2646	08176	88838	54443	42°15′	1837	47157	.4412499	73843
27°30′	3100	09508	96117	51436	42°30′	2741	50988	26656	66868
27°45′	3560	10862	.3803598	48386	42°45′	3655	54893	40961	59792
28°	22.4025	.0212240	.3811111	.9245293	43°	26.4580	.0358874	.4455415	.8952613
28°15′	4496	13641	18713	42155	43°15′	5515	62933	70021	45329
28°30′	4973	15065	26406	38973	43°30′	6461	67072	84779	37939
28°45′	4556	16514	34189	35745	43°45′	7417	71292	99691	30441
29°	22.5945	.0217987	.3842064	.9232472	44°	26.8384	.0375595	.4514759	.8922833
29°15′	6439	19486	50031	29153	44°15′	9362	79984	29983	15114
29°30′	6940	21010	58091	25786	44°30′	27.0351	84460	45367	07280
29°45′	7446	22559	66245	22372	44°45′	1352	89025	60910	.8899331
30°	22.7959	.0224135	.3874493	.9218910	45°	27.2363	.0393683	.4576615	.8891265
30°15′	8477	25738	82835	15400					
30°30′	9002	27368	91274	11839					
30°45′	9533	29026	99810	08229					

Table 4. Values of cos ϕ_n for Transverse Pressure Angle Helical Gears of 14 1/2-, 20-, and 25-Degree Transverse Pressure Angle

Helix Angle, ψ	cos ϕ_n		
	ϕ_t = 14 1/2°	ϕ_t = 20°	ϕ_t = 25°
5°	.9683783	.9401104	.9069234
8°	.9687359	.9407277	.9078795
10°	. . .	.9413544	.9087582
12°	. . .	.9420775	.9098269
15°	. . .	.9433646	.9117786
18°	. . .	.9449854	.9141367
20°	. . .	.9461887	.9159265
21°	. . .	.9468318	.9168846
22°	. . .	.9475017	.9178836
23°	. . .	.9481977	.9189230
24°	. . .	.9489193	.9200017
25°	. . .	.9496657	.9211189
26°	. . .	.9504360	.9222684
27°	. . .	.9512296	.9234645
28°	. . .	.9520445	.9246909
29°	. . .	.9528834	.9259518
30°	. . .	.9537420	.9272457
45°	. . .	.9684408	.9497051

Formulas (12) to (16) require that the cosine of the *normal* pressure angle, ϕ_n, be used in computing the span measurements. To facilitate calculations, values of the cosine of the normal pressure angle are given in Table 4 for transverse pressure angles of 14 1/2, 20, and 25 degrees for each of the commonly used helix angles.

Herringbone Gears

Herringbone gears do not have the end-thrust limitations that apply to single-helical gears. For this reason, most shaped herringbone gears are cut with high helix angles, often 30 or 45 degrees. Each helix is also only one-half the usual face width. As previously explained, high helix angles, narrow face widths, and large diameters present difficulties to the span system of measurement that are sometimes impossible to overcome. The span system will, therefore, usually be limited to use on herringbone pinions and small gears only; large herringbone gears will require other means of measurement.

Chicago the Stage of the 1954 Metal Show

SIGNIFICANT metallurgical developments will highlight the thirty-sixth National Metal Congress and Exposition, to be held in Chicago, Ill., November 1 to 5, inclusive. Close to 450 firms engaged in the refining, fabrication, and treatment of metals will utilize 263,000 square feet of floor space at Chicago's International Amphitheatre for the display and demonstration of their equipment, products, and services. This will be the 9th annual Metal Show held in Chicago.

The four sponsoring societies constituting the Congress will have their headquarters at the following hotels: The American Society for Metals at the Palmer House; the American Welding Society at the Hotel Sherman; and both the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing at the Morrison Hotel.

On Saturday and Sunday, October 30 and 31, the American Society for Metals will hold its annual Seminar. This year's topic will be "Imperfections and Impurities." Papers of particular interest to production men will include "The Influence of the Grinding Process on the Structure of Hardened Steel," by W. E. Littmann, research metallurgist, Timken Roller Bearing Co. and John Wulff, professor of metallurgy, Massachusetts Institute of Technology; and "The Hardenability of Carbon Tool Steel," by N. J. Culp, metallurgical department of the Carpenter Steel Co.

Technical sessions of the American Welding Society will include papers entitled "Flash-Welding High-Strength Steels," by W. G. Fassnacht, Bendix Aviation Corporation; and "Spot Welding Aluminum with Single-Phase Equipment," by J. W. Kehoe and D. R. McCutcheon, Westinghouse Electric Corporation; and "Recent Developments in Contact Electrodes," by D. L. Mathias, Acrods Corporation.

Among the papers scheduled for presentation at sessions of the Institute of Metals Division and the Society for Non-Destructive Testing are "The Preparation and Arc Melting of High-Purity Iron," by G. W. P. Rengstorff and H. B. Goodwin, Battelle Memorial Institute; "Warm Pressing of Beryllium Powder," by N. P. Pinto, Sylvania Products, Inc.; "Magnetic Particle Inspection," by W. E. Thomas, Magnaflux Corporation; and "Ultrasonics," by J. C. Smack, Sperry Products, Inc., and Peter Block, Branson Instrument Co.

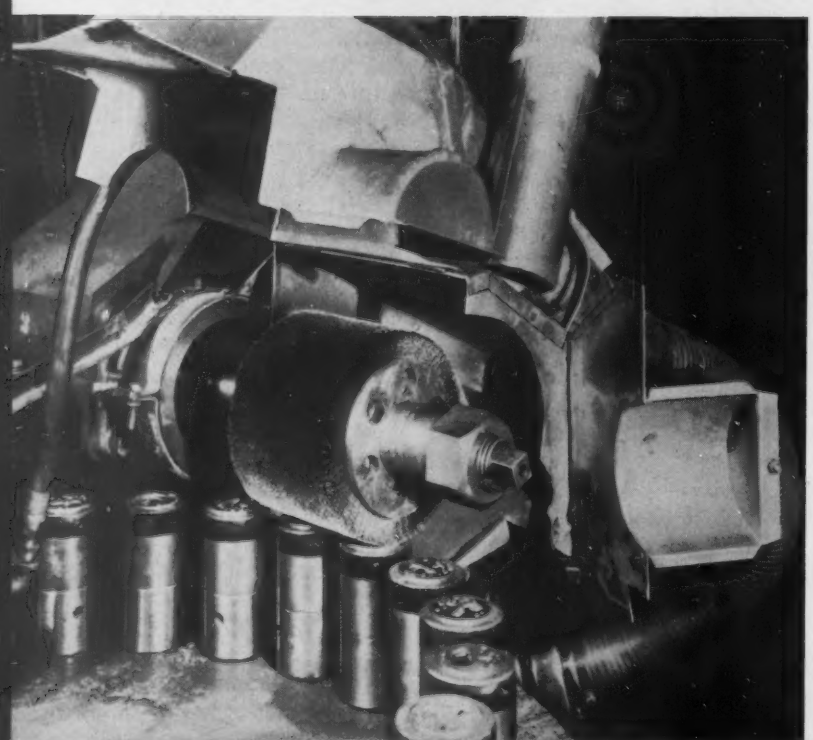
Alexander L. Feild, associate director of the Research Division, Armco Steel Corporation, who is the winner of the 1954 Albert Sauveur Achievement Award, will receive this annual award at the A.S.M. banquet. Also, the Medal for the Advancement of Research will be presented to William E. Umstattd, president of the Timken Roller Bearing Co.

In Shops Around the Country

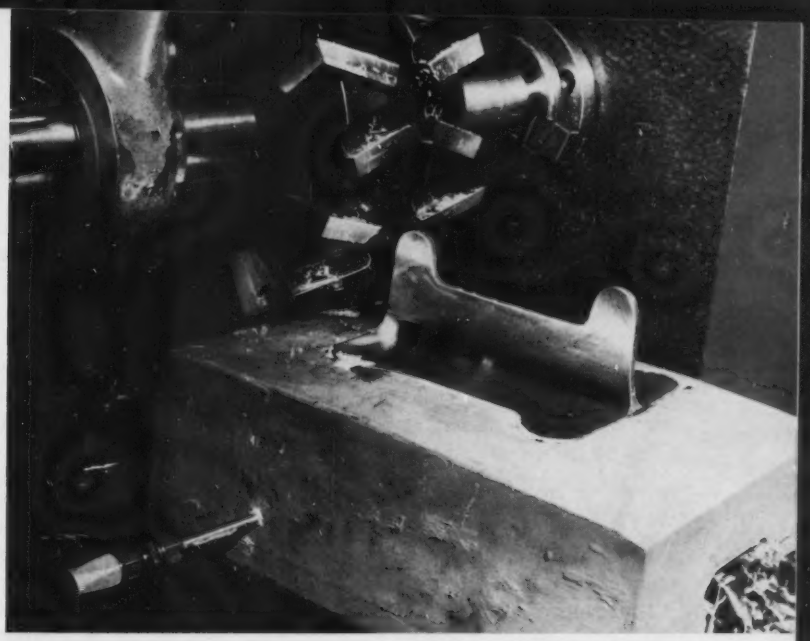
Camera highlights of some interesting operations performed in various metal-working plants throughout the nation



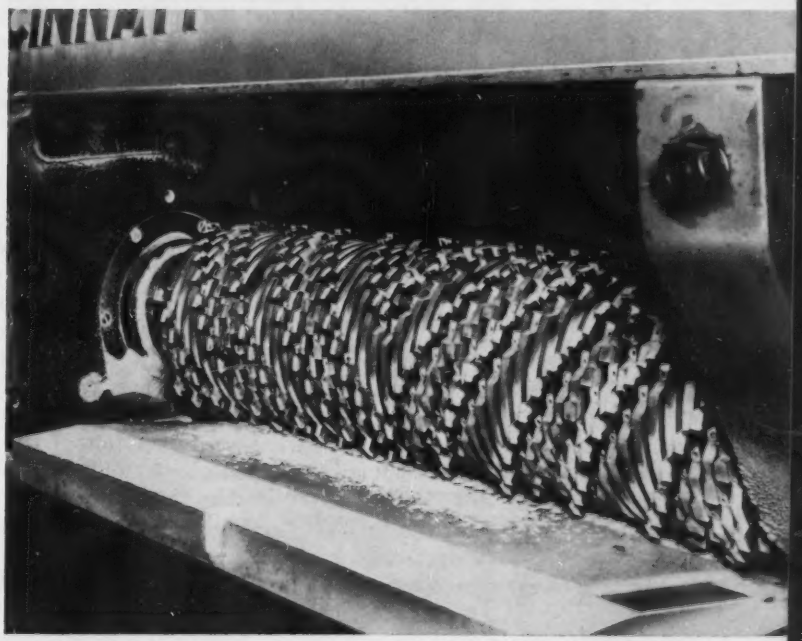
Stress-relieving brittle rim area of cold-formed steel domes at the Lukens Steel Co., Coatesville, Pa. A battery of gas burners heats the work for a depth of 6 inches. The domes are for high-pressure liquefied petroleum gas tanks.



Fuse discs are being deburred on a twenty-four spindle Parker automatic machine equipped with an Osborn brush at the rate of 15,000 per seven-hour day. The spindles rotate at 60 R.P.M. and the brush head, at 3600 R.P.M. Direction of brush rotation is reversed every two and one-half hours.



Odd-shaped castings are quickly milled by means of vacuum clamping at Chance Vought Aircraft, Inc., Dallas, Tex. A phenolic plastic block is molded to the contour of the base of the part, forming a nest. The suction line can be seen in the side of the block.



At the Switchgear Department of the General Electric Co., Philadelphia, Pa., this Carboloy-tipped cutter is used to mill plastic parts made from a compound of zircon sand, asbestos, talcum, and phosphoric acid. This is considered to be one of the most abrasive plastic machining jobs in industry.



Balancing a small air-cooling fan for an aircraft engine at Dean & Benson Research, Inc. Baldwin resistance-wire strain gages bonded on a vertical supporting rod make possible the location, measurement, and correction of unbalance in fans and rotors weighing up to 3000 pounds.

Effect of the New Tax Law on Equipment Replacement

By William Meyers
Attorney and Certified Public Accountant
Schwartz & Meyers
New York City

WHAT is it costing you not to replace your turret lathes? It may be costing more than you realize. One company replaced two old turret lathes with a new one. Output more than doubled and the company saved over $3400 a year. Another company invested in a new turret lathe and reduced the unit cost from $2.60 to $1.26 per piece. These savings might be yours—obtained through increased production which cuts costs—which, in turn, enables you to get and handle additional business.

The foregoing is the gist of a recent advertisement in MACHINERY. The advertisement made good sense when it was written, but the new tax law enacted by Congress makes this advice doubly important, because of the new methods of depreciation. The substantial sums of money that can now be deducted for depreciation during the early life of equipment permit a far more rapid restoration of the financial reserves than before. As a matter of fact, under the new law it can actually cost less to replace a machine every year than to keep it for its useful life.

The depreciation provisions of the law, for example, make it possible to buy a $10,000 machine and replace it every year with a new machine at a total after-tax cost of $2500 for a twenty-year period. Compare this with the cost of keeping the machine for its useful life—$10,000 for the same twenty-year period—and it becomes obvious that present methods of purchasing and depreciating machinery should be examined carefully.

Table 1. Amounts Deductible in Three Methods of Depreciation Permissable Under the 1954 Tax Law

Year	Straight-Line Method	Declining Balance Method	Sum-of-the-Digits Method
1	$500	$1000.00	$952.38
2	500	900.00	904.76
3	500	810.00	857.14
4	500	729.00	809.52
5	500	656.10	761.90
6	500	590.49	714.29
7	500	531.44	666.67
8	500	478.30	619.05
9	500	430.47	571.43
10	500	387.42	523.81
11	500	348.68	476.19
12	500	313.81	428.57
13	500	282.43	380.95
14	500	254.19	333.33
15	500	228.77	285.71
16	500	205.89	238.10
17	500	185.30	190.48
18	500	166.77	142.86
19	500	150.09	95.24
20	500	135.09	47.62
	$10,000 Total	$8784.24 Total	$10,000.00 Total

Declining Balance Method of Depreciation

The principal provision of the new tax bill permits the use of a declining balance method of depreciation at rates double those permitted under the straight-line method. This provision, however, applies only to new or rebuilt equipment put into use after December 31, 1953. In using the declining balance method, the rate of depreciation of the asset under the straight-line method is first determined. Then, instead of applying that rate each year until the full cost of the asset has been depreciated, double that rate is applied the first year. In subsequent years the double rate is applied to the remaining unrecovered balance of the cost left after subtracting the depreciation already taken.

For example, if in 1954 a purchase is made of a $10,000 machine with a useful life of twenty years and no salvage value, the depreciation allowance for each of the twenty years of its life will be as shown in the third column of Table 1.

The effect of the new declining balance method is to start off with the highest deduction in the first year of useful life and taper off to very low deductions in the last years. It is interesting to note that in the case of a short-lived asset such as a tool or die with a three-year life, a depreciation allowance of 66 2/3 per cent of the cost can be taken the first year under the new method as against 33 1/3 per cent under the straight-line method. In the case of an asset with a long life, say twenty-five years, the new method permits recovery of half the cost in nine years, whereas

the straight-line method takes twelve and one-half years. In general, the new method permits depreciation of 40 per cent of the cost of an asset in the first quarter of its life and two-thirds of the cost in the first half.

If a company were in a 50 per cent income tax bracket, the $1000 depreciation allowed on a $10,000 machine in the first year under the new method would save $500 in taxes. Therefore, assuming that the machine could be sold or traded in for $9500 at the end of the first year, with the $500 saved in taxes, a new machine could be bought without any additional outlay of capital. A $1000 deduction can again be taken in the second year and the process constantly repeated. The only cost would be a capital gains tax of $125 each year on the excess of the trade-in value, $9500, over the adjusted basis of the machine, or $9000. For a twenty-year period, the total after-tax cost would be $2500.

Table 2. Percentage Cost of Replacing Machinery Annually

Useful Life of Machine, Years	Cost to Replace Machine Annually (Per Cent of Original Cost)
3	8.33
4	6.25
5	5
6	4.167
8	3.125
10	2.5
12	2.083
15	1.667
20	1.25
25	1
30	0.83

If, on the other hand, a machine were kept for its twenty-year useful life and the expense of major repairs and overhauling averaged 5 per cent per year, or $10,000 for the twenty years, the total amount to be deducted, including the original cost of the machine would be $20,000. With a company in the 50 per cent bracket, the total after-tax cost would be $10,000.

It therefore becomes possible under the new law to replace a $10,000 machine annually at a net cost of $125, or 1.25 per cent of its original cost. In Table 2 is illustrated the annual cost of replacing assets which have useful lives of varying years.

Thus an asset which costs $10,000 and has a five-year life may be replaced annually at a cost of 5 per cent of $10,000, or $500, and one costing $10,000 with a ten-year life may be replaced annually at a cost of $250.

The computations cited are based on the supposition that the resale or trade-in value of the asset at the end of its first year will equal its depreciated value on the straight-line basis; or, as in the case of a $10,000 machine, that its resale value at the end of the first year would be $9500. More likely the resale value would be lower. If the resale value should be $9250 instead of $9500, it would cost an additional $250 to replace the machine, but at the same time the capital gains tax would decrease from $125 to $62.50. Therefore the annual replacement cost would be $312.50 when the resale value of the machine at the end of the year was $9250.

Table 3. Actual Replacement Costs of Machines Having Resale Values

Trade-In or Resale Value at End of First Year	Annual Replacement Cost	Total Replacement Cost Over a 20-Year Period
$9500	$125.00	$2500
9250	312.50	6250
9000	500.00	10,000

Annual replacement costs of machines with other resale values are as shown in Table 3.

The Various Depreciation Methods

The tax laws have never required that any particular method of measuring depreciation of machinery be used—only that the allowance for wear and obsolescence be reasonable. For example, the amount of depreciation actually sustained may be appraised at the end of each year and that amount charged to operations. This procedure has been approved in a number of cases and is considered preferable to any arbitrary method because the precise amount of each year's depreciation is calculated instead of a formula being applied that merely gives an estimate. But this method is not widely used, for it is cumbersome, difficult for the Bureau of Internal Revenue to administer, and too expensive for the average taxpayer.

Among the arbitrary methods of measuring depreciation, the one commonly used has been the straight-line method. Although many companies will switch to the declining balance method with respect to new machinery purchased after January 1, 1954, the straight-line method will still be used for assets purchased before this year.

The straight-line method insures the full recovery of cost at the end of the useful life of an asset, whereas the declining balance method leaves an unrecovered portion of some 8 to 13 per cent. Thus, if the plan is to keep an asset for its entire life, the attractiveness of the declining balance method is considerably lessened. To deal with this problem, the new law permits taxpayers to switch from the declining balance method to straight-line depreciation at any time in the

life of an asset. The straight-line rate would then be based on the remaining life of the property applied to the depreciated balance of the asset at the time of the switch.

The new law offers another solution to the problem of unrecovered cost. It gives the option of using the sum-of-the-digits method of depreciation. This method provides practically the same advantages as the declining balance method and yet insures full recovery of the cost of the machine at the end of its useful life.

Under the sum-of-the-digits method, if a machine has a twenty-year life, the rate of depreciation for the first year will be 20/210. The numerator of this fraction is the remaining useful life of the machine and the denominator is the sum of 1, 2, 3, 4, 5, 6, and every remaining digit up to 20. In the second year, the rate of depreciation will be 19/210; in the third year, 18/210; and so on until the twentieth year, when it becomes 1/210.

The depreciation allowances for each of the twenty years under the sum-of-the-digits method are given in the right-hand column of Table 1.

Determination of Useful Life

Aside from the method, the element that causes the most trouble in measuring depreciation is the determination of the useful life of the machine. This is frequently a bone of contention between taxpayers and the Bureau of Internal Revenue, the taxpayers tending to use a short life in order to increase the rate of depreciation and the Bureau taking the opposite view.

In determining the useful life of a piece of machinery, the principal factors to be taken into consideration are the physical life of the equipment, the rate of obsolescence, and the maintenance policy of the company. Other factors that may also have a bearing on the useful life are the type of labor operating the equipment, the raw material to be machined, and the number of working shifts under normal conditions.

The first step in determining useful life is to estimate how long the machine will be used under normal conditions. Such an estimate must be largely a matter of opinion based upon the aforesaid factors as well as on an expert knowledge of the busines operations. Bulletin F, issued by the Treasury Department, contains schedules listing the estimated useful lives and rates of depreciation of equipment used in various industries under average conditions. These estimated rates are by no means compulsory but they are helpful in anticipating the useful life that will be allowed by Treasury representatives.

Machinery will have a shorter life if there is not an adequate maintenance policy. The rates of depreciation in Bulletin F contemplate a reasonable expense policy for maintenance to keep the property in fair operating condition. If business conditions are such that more or less than average maintenance will be required, depreciation rates should be adjusted accordingly.

From a practical viewpoint, determining the number of years of useful life and the effect of such factors as obsolescence and maintenance policy on the physical life of equipment are matters of expert opinion. Most taxpayers either adopt the estimate of Bulletin F or accept their accountant's estimate.

If the amount of machinery owned by a company is great enough so that the depreciation allowance is an important expense, it is often desirable to employ competent appraisal engineers to determine the useful lives of the machines in the light of the various conditions which exist. The expense of such an appraisal is frequently outweighed by the fact that the calculations of competent appraisal engineers are preferred by the Bureau to the guesswork of unqualified persons, with resultant savings in the cost of disallowances and in tax litigation.

In many businesses, the equipment is subject to hard usage and unusual wear and tear. Secondhand machinery is often employed. Also, the necessity of continuous work and lack of proper maintenance tend to limit the useful life of a machine. The Bureau recognizes these facts and under certain conditions permits companies to accelerate the rates of depreciation.

Accelerated depreciation may thus be permitted because of such factors as overtime operation of equipment, inexperienced operators, and the use of machines on work for which they were not specifically designed. However, accelerated depreciation will not be allowed unless it can be shown that maintenance did not compensate for the increased use and arrest the accelerated depreciation. Mere proof of abnormal use of machinery will not entitle anyone to an increased allowance. It must be shown that the abnormal use of the machine specifically shortened its useful life.

Adequate records must be kept of machines in order to obtain the maximum depreciation allowance. An adequate card index or other system should be kept to record the data that enters into the computation of the depreciation for every piece of equipment. These records must substantiate the depreciation deductions on the company's tax return. The records should show the date, source, and price paid for each machine and give a description of each addition or improvement, together with the date and cost of the improvement. Similar data should be recorded for each machine retired or sold.

Salvage Value Not Considered in Declining Balance Method

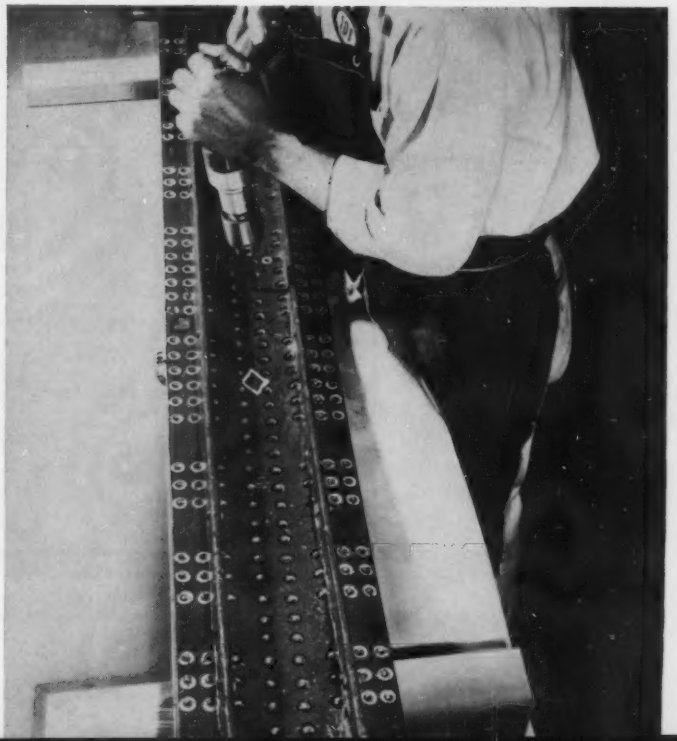
A curious aspect of the declining balance method under the new tax law is that it is computed without regard to salvage value. When a machine has a significant salvage value at the end of its useful life, the new method starts out with a depreciation deduction appreciably greater than twice the straight-line method. For example, if a $10,000 machine were to have a salvage value of $3000 at the end of its twenty-year life, the annual straight-line depreciation (based on cost less salvage value divided by twenty) would be $350. The new method, however, allows twice the straight-line rate of 10 per cent on the undepreciated balance, so that the first year's depreciation under the new method is still $1000, the second year's $900, and so on. Thus, where salvage value is significant, the resulting widened gap between the new method and straight-line depreciation would seem to increase the attractiveness of replacing assets annually.

The liberalized depreciation methods in the tax law are limited to new machines never before subject to depreciation allowances. This means that used machinery cannot be depreciated under the new method. The purpose of this provision is to discourage transfer and exchange of partially depreciated assets simply to obtain the high initial depreciation deduction. While the new tax law affects only future depreciation allowances, the Bureau of Internal Revenue has recently been allowing greater discretion in the timing of depreciation deductions.

The Editor of MACHINERY pointed out in a recent editorial that it never pays to use worn-out or obsolete equipment. He showed that "28 per cent of production equipment in the metalworking industries is considered obsolete or inadequate by the users themselves, who admit the need of modernization or replacement." The new tax law certainly provides impetus for such replacement from a dollars-and-cents viewpoint. If a company can obtain the use of modern equipment at a net cost equal to or lower than that of obsolete equipment, its competitive position will obviously be greatly improved.

There is also a real advantage in getting a greater depreciation deduction in the early years of the life of an asset, for money saved on taxes may materially increase the working capital. If a company is dependent on current earnings and short-term loans for investment funds, a faster recovery of capital invested in equipment will increase the working capital and make it possible to secure short-term loans which would otherwise not be available.

However, it should be emphasized finally that business policy ought not to be based on tax considerations alone, and regardless of the new tax law, depreciation and purchasing policies should be guided by the economic considerations, pertinent to the particular business.



Drill shells constructed from fiber glass and provided with steel bushings have been found inexpensive and easy to handle in the San Diego shops of the Convair Division of the General Dynamics Corporation

Five Hundred Dollars in Prizes for Articles on Ingenious Mechanisms

MACHINERY is offering $500 in cash prizes for the eight best original articles on ingenious mechanisms to be submitted before January 1, 1955. Each article should be confined to a description of one mechanism or one mechanical movement that has proved its practicability in actual use, and has not previously been described in the technical press.

Here is how the awards shape up:

First prize $200
Second prize $100
Two additional prizes.....$50 each
Four additional prizes.....$25 each

But this is not all. MACHINERY'S high-level space rates will be paid not only for the prize articles but also for all other articles that are accepted for publication that may not receive a prize. In other words, although your material may not win one of the eight prizes, you still stand to receive payment for your efforts. Another point—you need not be a subscriber to the magazine.

Forward as many articles as you like. They will all be entered in the competition and may all be accepted for publication—but no contestant will receive more than one cash prize.

The Procedure is Simple

1. Send a drawing of the mechanism (or photograph if preferred—or both) that clearly shows all important parts of the particular movement to be described.

2. Describe as clearly as possible both the *purpose* of the mechanism and its *action—how* it does *what* it does.

3. Mark the important parts on the drawing, such as levers, cams, etc., with letters, *A, B,* etc., and use corresponding letters to identify those parts in the description; thus, "Lever *A* is operated by cam *B*." This will help to make the description readily understood.

4. Confine each article to a single mechanism or movement; do not describe an entire machine or refer to parts that do not affect the movement being described.

A Few Helpful Hints for Contestants

Clear blueprints or pencil drawings with distinct lines are satisfactory for illustration. They should be made on separate sheets of paper. Send only drawings that are to scale, with the various parts shown in correct relationship and proportion. Rough free-hand sketches cannot be used. The drawing should show the assembled mechanism, although a diagram may be substituted if it more clearly illustrates the arrangement of a complicated mechanism.

Avoid describing a mechanism that is familiar to most designers; descriptions of movements that are generally known cannot be accepted, even though they may be very ingenious. It is immaterial how long ago a mechanism or movement was designed, provided it has not previously been published.

And Finally, the Mailing Address

Mechanisms Contest Editor
MACHINERY
148 Lafayette St.
New York 13, N. Y.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Quick-Acting Multiple Milling Fixture

By FEDERICO STRASSER, Santiago, Chile

A milling fixture capable of gripping four work-pieces simultaneously may be seen at X in the accompanying illustration. Rapid clamping, unclamping, and ejection of parts are timesaving features of this tool. The fixture is of simple construction, thereby keeping its cost at a minimum.

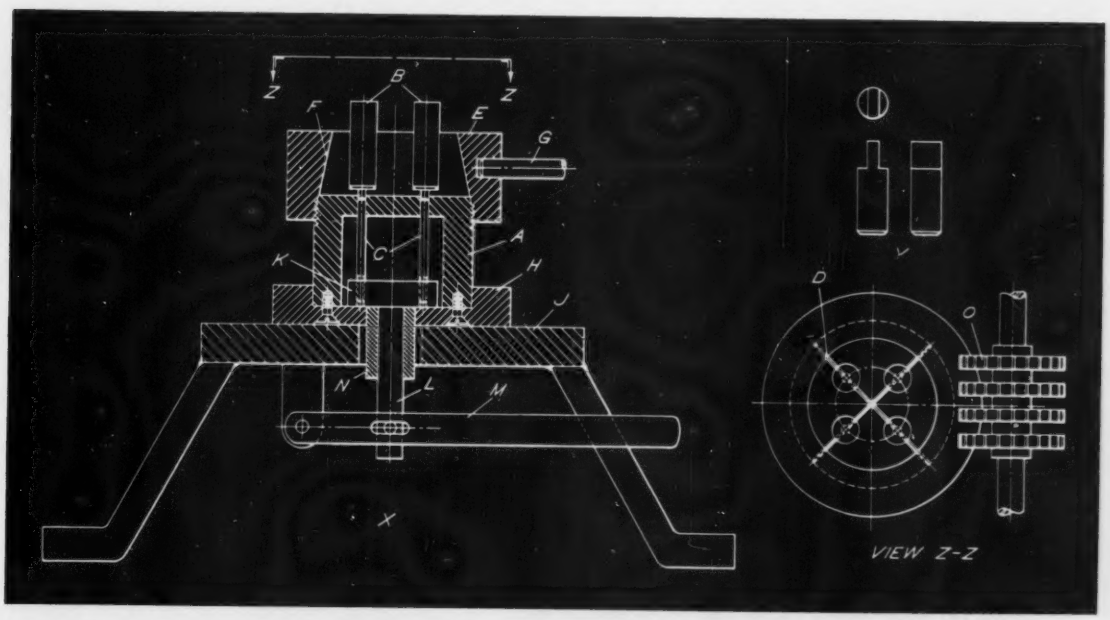
Four holes are drilled into a tool steel body *A* to receive work-pieces *B*. Holes of smaller diameter are drilled on the same four centers to provide guides for ejector-pins *C*. Two narrow slots *D*, (view Z–Z), milled at right angles to each other, pass through the centers of these holes and are cut slightly deeper than the bottom of the larger holes. The slots impart the action of a spring collet to the upper end of the body.

External threads, which are cut around the upper part of the body, mate with the internal threads of the nut-like clamping member *E*. Due to the action of the mating tapers at *F*, the split face of the body may be closed or opened by rotating the nut. A handle *G* is furnished for ease of operation.

A base *H* is screwed to the fixture body, and this complete unit is clamped to auxiliary table *J*. This table is bolted to the work-table of the machine during the milling operation. Body *A* is secured to its own base rather than directly to the table so that the same table may be used to hold any one of several similar fixtures.

All four ejector-pins are threaded into a single ejector-plate *K*, which is actuated by rod *L* and lever *M*. The rod passes through a guide bushing *N* that is pressed into the base. Lever *L* extends between two legs of the auxiliary table.

To use this fixture for machining a tongue on the cylindrical work-piece shown at Y, nut *E* should be backed off far enough to relieve any pressure on the tapered surface of the body. One part is then inserted in each of the four large holes. Tightening the nut will force the split gripping surface together, thus holding the parts securely.



Milling fixture that holds four work-pieces simultaneously provides rapid loading, unloading, and ejection of parts

By using a gang-milling set-up *O*, the tongues may be finished in one pass. Part removal is very simple. Merely backing off nut *E* will unclamp them; then lifting the ejector lever will unseat and raise the parts for easy removal.

Grinding Wheel Radius Truing Device

By W. C. Betz, New Britain, Conn.

Occasionally it is necessary to dress a grinding wheel to a large radius in order to obtain some desired curvature in a forming cutter or die part. The illustrated device, designed specifically for a tool and cutter grinding machine, can be used to produce either a convex or a concave shape on the periphery of a grinding wheel during truing.

Directly beneath the wheel *A* and extending over the rear of the machine table *B* are two rectangular steel plates *C* and *D*. The front end of the lower plate is held on the magnetic chuck *E* of the grinder. A cable rig *F* supports the rear end of this plate. Both plates are provided with a series of holes *G* accurately located on 1-inch centers. Holes in the upper plate are 1/16 inch larger in diameter than those in the lower plate, in order that the fulcrum bolt *H* can be seated properly.

The diamond dressing tool *J* is supported on the center of the wheel by a post *K*. This post is so fastened to the upper plate that distance *a* is exactly 1 inch. To adjust the tool, gage piece *L* is temporarily attached to the post. A shelf on the gage piece, 1.250 inches wide, accommodates one or more size blocks. In the illustration, only size block *M* is required. If, for example, a 1 1/2-inch convex radius is required, the fulcrum bolt occupies the second pair of plate holes, as illustrated, and the diamond tool is set against a 3/4-inch size block. Thumb-screw *N* locks the tool in position, after which the gage piece is removed. With the wheel revolving, plate *C* is pivoted manually, and the table saddle is slowly advanced toward the grinding wheel.

By constructing the post so that width *b* is 1.000 inch, the device can be used to produce a concave wheel periphery. In this instance, the plates are reversed so that they extend over the front of the table, the gage piece is attached to the opposite side of the post, and the diamond tool is reversed in the post.

The wheel of a conventional surface grinder can also be dressed with this device. Since the wheel axis is at right angles to the stroke of the table on such a machine, the plates can be held without the need for a supporting cable and bracket rig *F*.

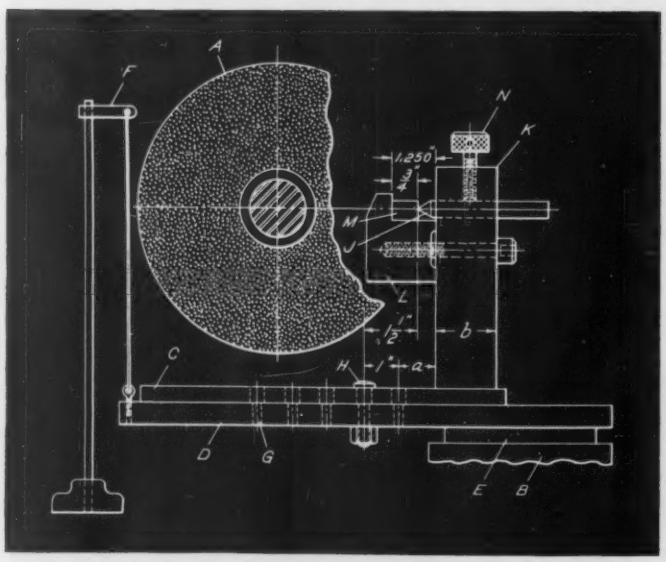


Plate (C) pivots around fulcrum bolt (H) to produce the desired radius in the periphery of wheel (A).

Machine Vise Adapted for Special Milling Job

By W. M. Halliday, Southport, England

A simple adaptation of the ordinary machine vise can often be used instead of an elaborate fixture or jig that may at first appear necessary. The slotted lever shown in Fig. 1 is such a part. The vise was employed in an operation that involved machining a number of angular surfaces. Bearing hole *A* and small hole *B* were bored prior to milling slot *C*, so as to provide locating surfaces. Flats *D* and *E* are parallel and at right angles to the vertical center line of the two holes. Surfaces *F* and *G* incline, as shown. Flats *H* and *J* are parallel to surfaces *F* and *G*, respectively.

The fixture consists of two steel plates *L* and *K*, Fig. 2, which are machined all over and ground on the front and rear surfaces to seat firmly against the vise jaws *N* and *O*. Groove *M* is machined on the outer face of each plate 0.002 inch wider than the vise jaws to provide positive locating. Four cap-screws *P*, which normally retain serrated gripping pads, are used to secure plates

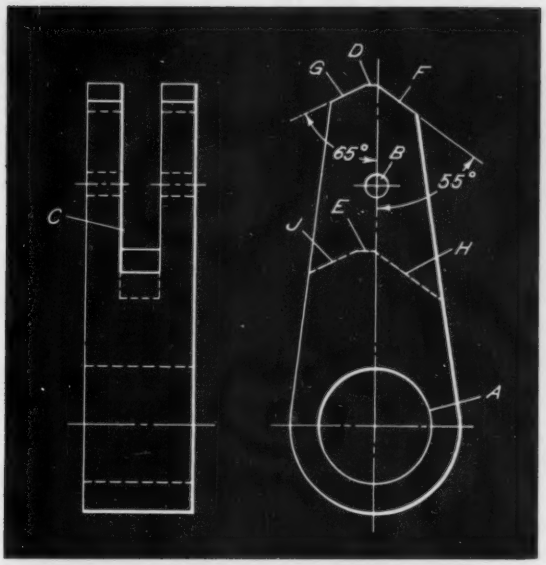


Fig. 1. Lever machined through the use of a fixture which is constructed around vise jaws

L and K to the vise jaws. Alignment of the two plates is obtained by means of four hardened steel dowels Q, which are pressed into plate K and are a sliding fit in plate L.

The large end of plug R is a close slip fit in hole A. Plug R is adjustably fitted to plate K, shank S of the plug engaging a V-shaped slot with two unequal legs. Leg T is inclined at an angle of 35 degrees to the vertical center line, and leg U at 25 degrees. An irregular recess V is machined in the rear of plate K to accommodate washer X. A flat-head machine screw W passes through the bore of the washer and secures plug R.

Hole Y, the same diameter as hole B in the lever, is drilled through the front plate to receive a pin Z for locating the lever in the vertical position. Two additional pairs of locating holes are provided at a, b, c, and d, into which the locating pin may be inserted for positioning the work-piece at the required angles for machining the various angular surfaces.

To load the fixture, the vise jaws are opened and the lever is slipped on plug R while it is at its lowest position. The locating pin is then inserted into hole Y of the fixture and hole B of the work-piece. Closing the vise jaws locks the part firmly in place.

Thus loaded, the work-piece is in the No. 1 position shown in Fig. 2. In this setting, slot C and flats D and E are machined simultaneously by using a gang of three cutters. The vise is then opened slightly and the work-piece moved to position No. 2, the locating pin being placed in hole a. The difference in height of the locating holes results in the shank being drawn up into leg T of the V-slot. In this setting, a single broad milling cutter is employed to machine flat F in one pass.

The vise jaws are again released slightly and the work-piece moved to position No. 3, the locating pin being inserted in hole b. A single pass under the same broad cutter will finish machine flat G. By utilizing locating holes c and d in two more settings, surfaces H and J (Fig. 1) may be milled. For these cuts, the cutter that originally formed the slot may be used. Due to the gripping pressure of the vise, no strain is placed on pin Z.

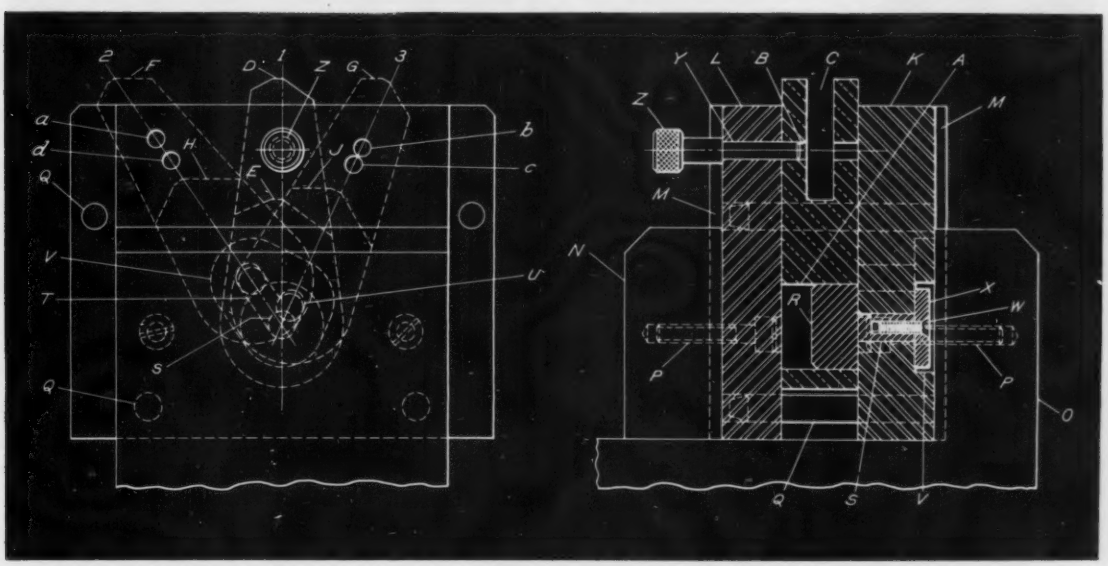


Fig. 2. Milling fixture designed for use in machining various surfaces of the lever in three settings

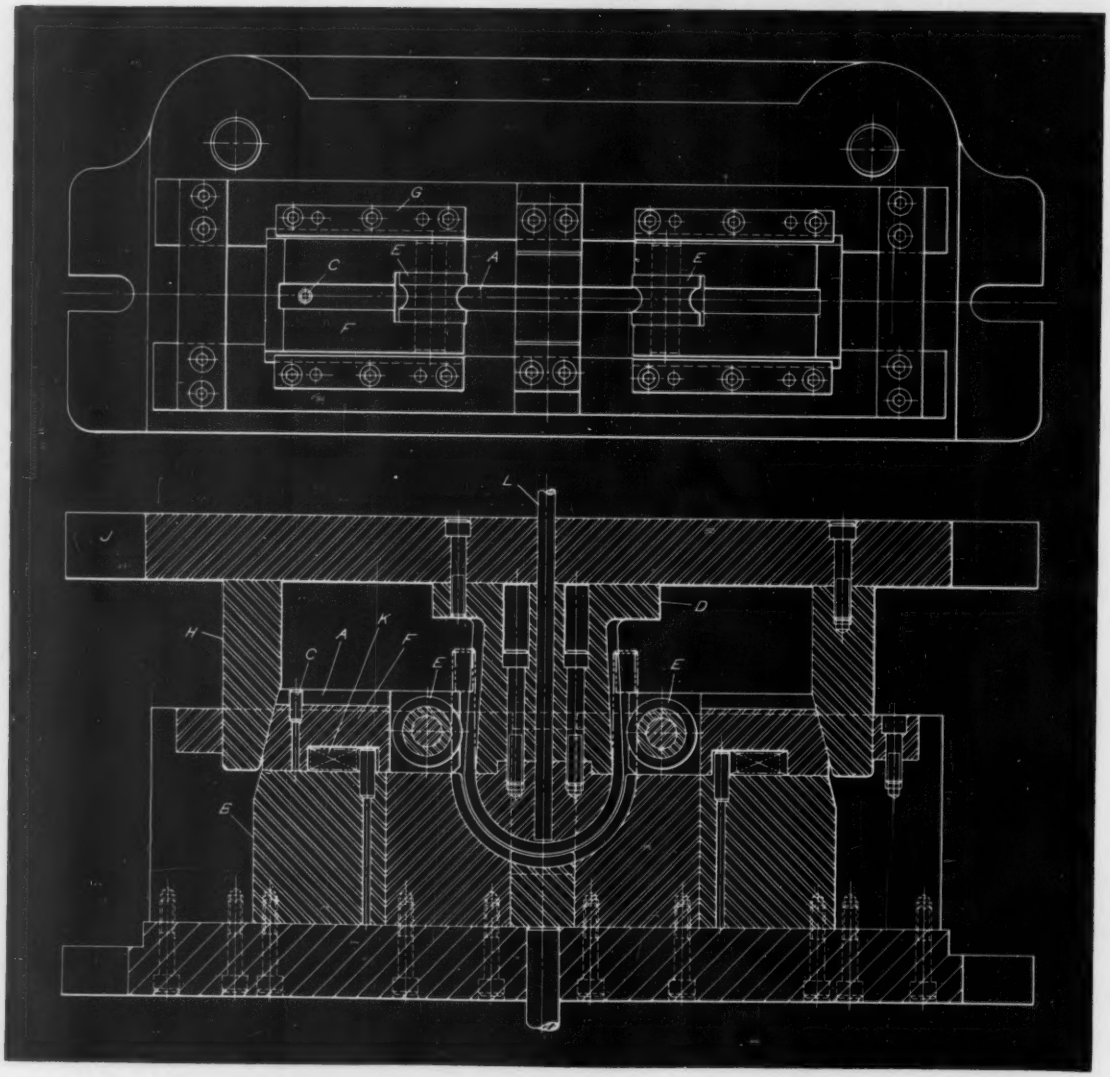
Bending Die with Work Rollers

An improved means of forming U-bolts is provided by a press die having a pair of integral rollers. These particular bolts are made from 3/4-inch carbon steel rod. Previously, after being cut off to length and threaded, they were hot-bent on a bulldozer. The method was slow, and the heating could not be completely localized in the bend area. Scrap loss was excessive because of distorted threads.

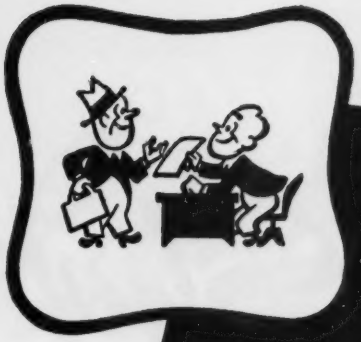
In the bending operation now performed, the U-shape of the bolt is produced by the die illustrated. First, the unbent threaded rod length is positioned in a channel *A* in the top of the die *B* against an end-stop *C*. On the down stroke of the ram, the rod is thrust into the die by the punch *D*. At the same time, the legs of the work are supported by the two rollers *E*. These rollers are cross-pinned to slides *F* which operate laterally beneath keeper-plates *G* on the top of the die.

The movement of the slides is set up by the stroke of the ram, through the cam action of lugs *H* fastened to the bottom of the punch-plate *J*. Slide travel is made against the pressure of springs *K*, so that the slides retract automatically on the up stroke. A knock-out rod *L* ejects the U-bolts from the punch.

The rollers rotate freely, premitting the work to move over them smoothly. All drag and wear on the top of the die cavity are eliminated. Further, since the work is bent cold, no thread distortion occurs. Compensation for possible spring-back of the material can be made, if necessary, by inserting shims between the lugs and the punch-plate, thus slightly increasing the lateral movement of the slides.



With the work moving over the rollers (E), there is no drag or wear on the top of the die cavity



The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

Personalized Selling

WHEN I recently interviewed a young man who was a prospective sales engineer for an industrial equipment manufacturer, he asked: "Are all this company's men drawn through the same die or cast in the same mold? Has the sales manager got quirks and prejudices? Will I have to wear a white shirt and red bow tie, and adopt a certain lingo in talking to customers?" What this young man feared were the pressures of conformity that stifle individuality in taste, thought, and action.

Everyone knows that, as corporations expand and work becomes more specialized, the urge toward conformity is intensified. Wise management recognizes the growing problem of being able to treat men as individuals rather than as types.

This very same problem faces the sales engineer with his everyday selling. Listen to the words of two salesmen in their different approaches to a prospect:

> "Purchasers have invariably been satisfied with the results from this gear shaper."
>
> "Mr. Philips, you yourself will be especially proud of the accuracy and speed of this gear shaper after it has been installed."

The first statement is general and stereotyped, the second specific and personal.

This principle of dealing with persons rather than types is one repeatedly neglected in selling. Many of us forget that individualism springs eternal in the human heart—that we abhor being considered commonplace—that we are always eager to be dealt with as persons—that we enjoy individual recognition by our audience, be it large or small.

Sales training courses emphasize customer interests and the art of pigeonholing people according to type. We are urged to select and apply approach No. 3, 5, or 7, according to the tag on the prospect's back. But how about establishing relationships with Ralph, Tom, or Harold as an individual?

One sales engineer of our acquaintance is an outstanding success. He has the know-how, and is hailed as a great personality. His success does not depend on personal charm, but largely on his genuine interest in each person.

It would be paradoxical to lay down fixed rules for personalized selling. That would be to revert to formula or gage, which in this instance is to be deplored. However, certain suggestions may quicken our consciousness to the supreme importance of dealing with each member of the purchasing fraternity as a person.

Above all, let us recognize that people are different, although their duties and working environment may be the same. We should form the habit of studying people and their reactions. In time, we acquire intuition, which enables us to quickly sense the interests, desires, and peculiarities of individuals as such. By so doing, we instinctively compare them with ourselves. We broaden our sympathies, become more tolerant.

Let us avoid abruptness in approach, for without knowing the traits of our prospect, this can be disastrous. As we widen our contacts, we acquire the art of diplomatically substantiating sound opinions opposite to those of the prospect. Diversity of ideas is the spice of life. Contradiction without factual supports can be unconvincing, even obnoxious. Friendship flourishes from an understanding of both divergent and coinciding opinions.

Selling largely consists of molding opinion. In spite of the enormous power of promotional programs in influencing the prospect, personal contact is still a vital factor when it comes to selling industrial equipment. We can increase sales if we focus our attention on the art of developing a satisfactory relationship with whomever we contact.

LATEST DEVELOPMENTS IN *Shop*

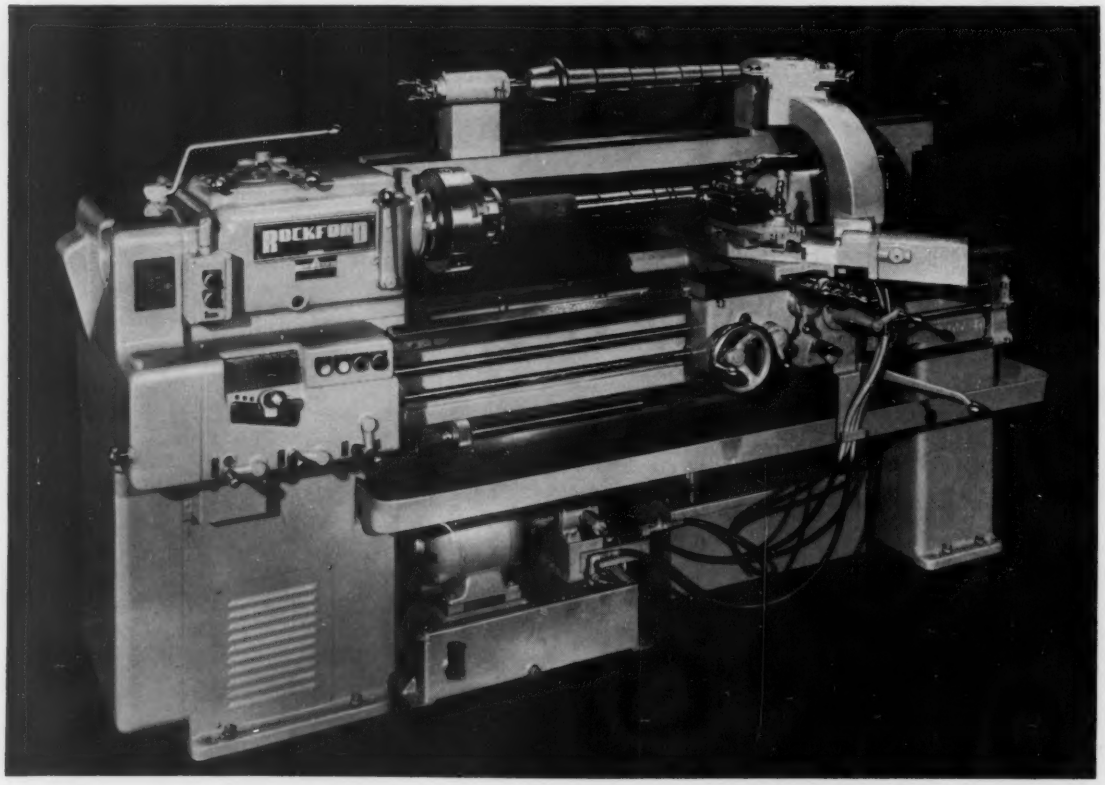
Rockford All-Geared Head Tracer Lathe

The Rockford Machine Tool Co., Rockford, Ill., has recently added a versatile tracer lathe to its regular line of machine tools. The basic machine is an all-geared head, 18-inch engine lathe equipped with a 5-H.P. motor. It has twelve spindle speeds ranging up to 1140 R.P.M. and thirty-two feed changes. The lathe is available with beds from 6 to 12 feet in length.

The tracer control is an adaptation of the "Kopy Kat" duplicator previously furnished on other Rockford machines. All components of the tracer, with the exception of the pump, are also manufactured by the company.

An independent sealed pumping unit, including a governor-controlled pump, is mounted directly under the chip pan. The tracer valve is mounted on an over-arm at a convenient height for the operator. All hydraulic lines from the valve pass through the over-arm and along the apron so that they are clear of chips, coolant, and work or operator interference. The system operates at a maximum unit pressure of 400 pounds per square inch and develops a total holding force of 1650 pounds.

The first piece of a small lot can be manually turned on the lathe and then used as the master for any number of subsequent pieces. The master is held on centers, a spring-loaded, lever-operated tailstock being provided to facilitate mounting. Micrometer adjustment of the master from the operator's position simplifies tool setting and adjustment for finishing cuts.



Versatile tracer-controlled engine lathe announced by the Rockford Machine Tool Co.

For more information on these products, use Inquiry Card, page 243

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

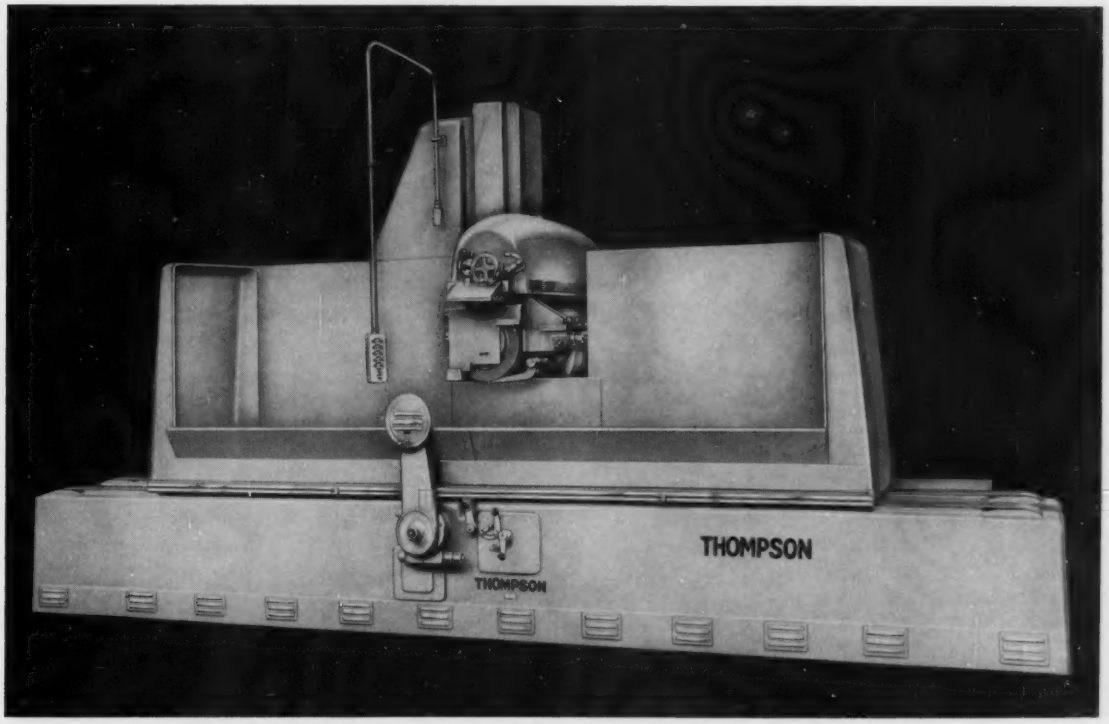
Edited by FREEMAN C. DUSTON

The tool-slide is positioned at a 45-degree angle and permits a maximum diameter change up to 6 inches with a maximum work swing of 10 1/2 inches over the carriage. Convenient 90-degree infeed control is possible by means of a vertically mounted, double ball-crank. An automatic feed throw-out clutch is furnished as standard equipment on this machine. Screw adjustment permits fine selection of the throw-out point, eliminating danger of work spoilage due to overtravel. An apron spindle control may be obtained to further simplify the operation of this 18-inch tracer lathe. 101

Thompson Extra Heavy-Duty Surface Grinders

Hydraulic surface grinders that offer extra power and precision for heavy-duty production work have been brought out by the Thompson Grinder Co., Springfield, Ohio. Outstanding features include a cross-feeding wheel-head with horizontal spindle that permits grinding with the periphery of a wheel 20 inches in diameter; means for rapid and accurate positioning of the wheel and work; and simplified, centralized control. "In position" wheel truing; a direct-coupled motor drive to the wheel-spindle; a low-pressure hydraulic system; and automatically lubricated ways, slides, and spindle bearings are also features of these grinders.

The machines are made in sizes from 30 by 26 by 72 inches to 36 by 36 by 24 inches, or larger. The model illustrated is 36 by 48 by 120 inches and has an auxiliary raised elevation attachment and a swinging push-button station. Table speeds range from 10 to 100 feet per minute. The vertical feed is at the rate of 15 inches per minute and the cross-feed at a rate of from 1/32 inch to 3 inches per minute. Hydraulic wheel truing is at the rate of 6



Heavy-duty surface grinder which was recently brought out by the Thompson Grinder Co.

For more information on these products, use Inquiry Card, page 243

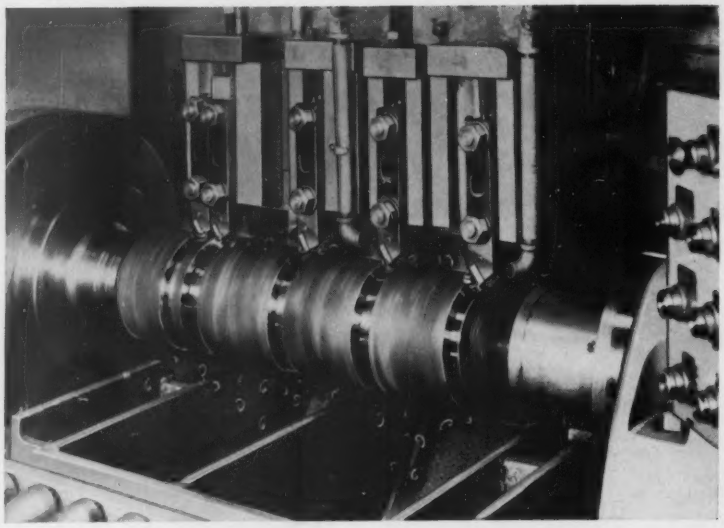


Fig. 1. Contour-turning operation using multiple carbide tools

inches per minute and hydraulic rapid traverse is at the rate of 240 inches per minute.

Auxiliary equipment includes an automatic down feed; a micrometer back-up stop; equipment for applying coolant through the wheel; Hoglund Magniform contour dressers; a coolant filter; and Delpark coolant filters. . . .102

Hydra-Feed Automatic Lathes with Reverse Rotation

The Hydra-Feed Machine Tool Corporation, South Norwalk, Conn., with engineering and sales offices in Ferndale, Mich., has announced a line of automatic lathes designed for high-production boring, facing, and turning of straight, tapered, or irregular contour work. These machines are particularly adapted to automation as they are designed to facilitate automatic work-loading and to employ carbide tools. An automatic chip removal system is also provided.

One of the unusual operating characteristics is that the direction of spindle rotation is the reverse of normal practice. This has made possible the elimination of all tooling from the front of the machines, resulting in an unobstructed loading area—an important advantage from the standpoint of automation.

Reversing the direction of work rotation has also resulted in several other advantages. Tool pressures on the rear tools are "downward" instead of "upward." This permits full advantage to be taken of the heavy base of the machine to provide a smooth, powerful cutting action at high speeds. Combined cutting speeds and feeds giving metal removal rates as high as 52 pounds per minute have been used successfully. The large opening in the rear of the bed simplifies the installation of the automatic chip removal equipment.

Indicative of the metal removal capacity of these machines is the power for which they are designed. For instance, a motor of 30 H.P. running at a speed of 1800 R.P.M. is recommended for the spindle and main drive of the Model HD-8 lathe. The Model HD-16 lathe has a 100-H.P. motor. Spindle speeds are infinitely variable from 82 to 2400 R.P.M. on the Model HD-8 lathe; from 98 to 1475 R.P.M., on the Model HD-12 lathe; and from 66 to 1072 R.P.M. on the largest model.

The Hydra-Feed lathes are designed to conform to both hydraulic and electrical J.I.C. standards, thus simplifying maintenance, reducing "down" time, and simplifying repairs when required. The hydraulic carriages and slides may be operated in practically any combination or sequence. They can also be operated independently through selector switches and push-buttons on the central control panel.

Roughing and finishing of parts can be accomplished in the same set-up and with the same tooling, without stopping the machine. This feature is particularly important where unusually deep cuts are called for on some portions of the work. Either cam control of carriages and slides or tracer operation is available. Rear as well as top carriages can be adapted for longitudinal feeds. All models can be supplied either with the

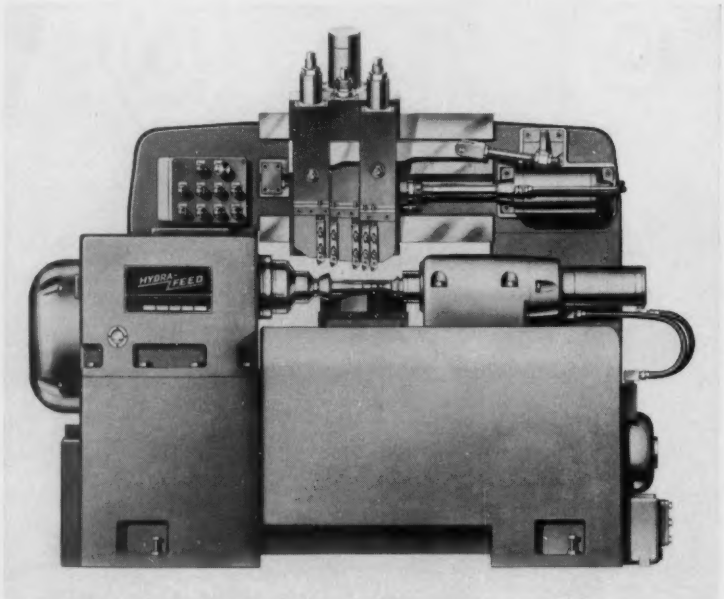


Fig. 2. High-production lathe built by Hydra-Feed Machine Tool Corporation

For more information on these products, use Inquiry Card, page 243

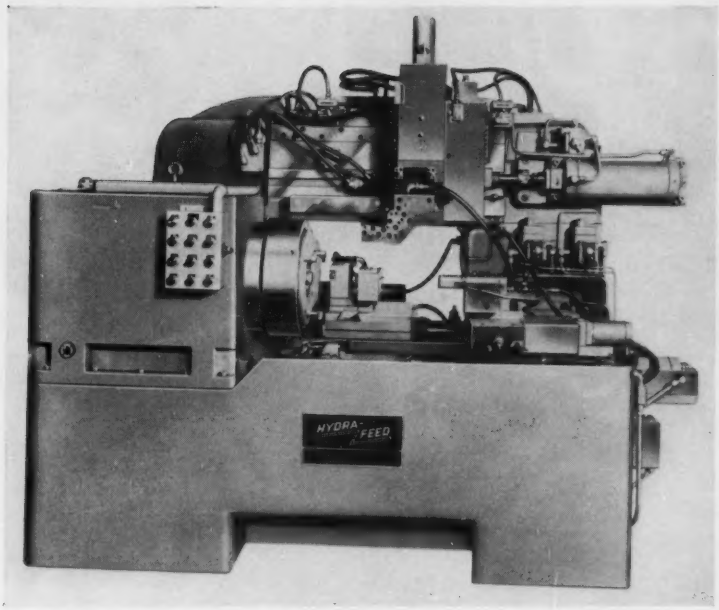


Fig. 3. Hydra-Feed chucking lathe with 75-H.P. motor for spindle drive

hydraulically operated tailstock or with standard or special platen slides. The latter are particularly suitable for straight- or contour-boring, facing, grooving, or plunge-cutting operations. ...103

Gear-Speeder Inspection Unit Featuring Automation

A Model GSC Red Ring gear-speeder inspection unit that automatically loads spur and helical gears for sound-testing, runs them at desired speeds, and unloads them on a conveyor line is announced by the National Broach & Machine Co., Detroit, Mich. The operator simply listens to the sound of the production gears as they are rotated in contact with a master gear and diverts any gears from the unloading chute which do not meet inspection standards for sound.

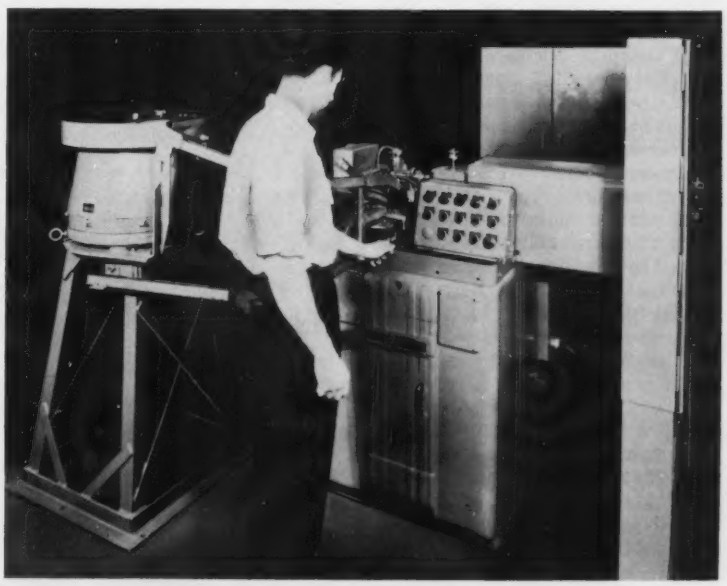
Gears from a conveyor are directed to a vibrating type hopper feed device in the unit from which they are fed through an input chute to a storage magazine ahead of an automatic loading device on the speeder. The hopper feed of this new machine operates intermittently and is controlled by the loading condition of this chute.

The loader is of standard Red Ring rocker type design which feeds the gears one at a time from the storage magazine into mesh with a master gear. At the same time, a gear is loaded in the speeding position, a finish tested gear is dropped into the unloading chute and directed back to a gear conveyor line. The gear is supported during the test by an expanding arbor which automatically enters the gear during the loading sequence. This arbor is mounted on the headstock and expands in the bore of the gear.

The diverter in the unloading chute is manually operated to direct unsatisfactory gears to a table area on top of the speeder unit. Here they can be examined by the operator who may correct them by removing nicks or burrs with a pencil type grinder. When the speeding cycle starts, the gear to be sound-tested is in mesh with the master gear. It is run in one direction in mesh for a predetermined time and a brake load is automatically applied. Then the brake load is released and the gear is rotated in the opposite direction. A brake load is applied a second time following which the master gear rotation is stopped and the loader is cycled through its functions.

Push-button controls for each machine function facilitate set-up operations. Air cylinders control the work-arbor, loader, and brake functions. Since the machine must operate at minimum sound levels, separate panels of sound-suppressed construction are provided for the electrical and pneumatic controls.

The speeder unit is powered by a 1-H.P. motor. The machine illustrated is sound-testing an automatic transmission eighteen-tooth, 16-diametral pitch helical pinion having a pitch diameter of 1 3/8 inches and a face width of 2 1/2 inches. 104



Red Ring gear-speeder inspection unit that automatically loads, sound-tests, and unloads spur and helical gears

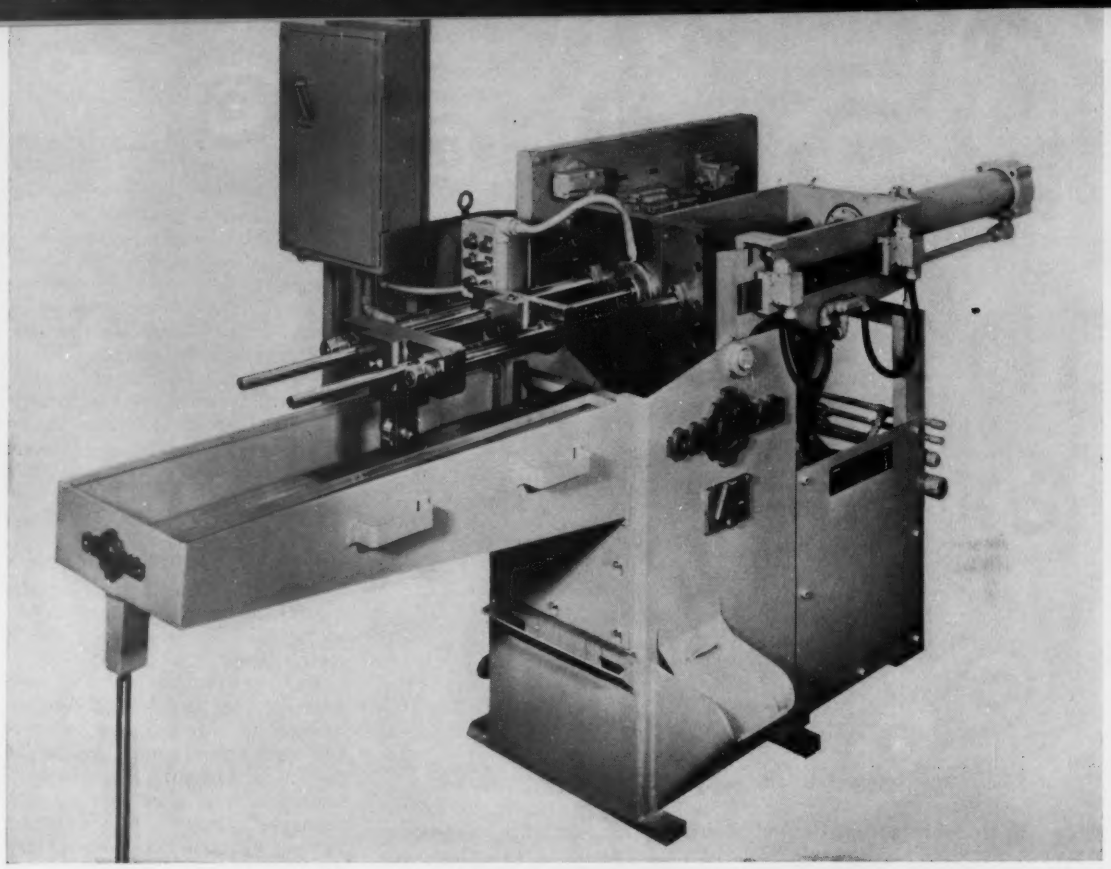


Fig. 1. Colonial "4" broaching machine in horizontal position with chip pan attached to base

Colonial Multiple-Purpose Broaching Machine

A multiple-purpose horizontal-vertical broaching machine capable of four different basic broaching or press operations has been developed by the Colonial Broach Co., Detroit, Mich. This versatile Colonial "4" machine will handle push and pull-down broaching as well as press operations in the vertical position, and also provides the advantages of horizontal broaching.

Horizontal and vertical positions of the working bed are assumed by pivoting the bed section about the top of the base by means of a hydraulic lift cylinder. The rated capacity in the vertical position is 8 tons and in the horizontal position, 6 tons.

Power for the lift cylinder is supplied by a hydraulic pump and motor unit mounted on a separate base that also houses the hydraulic fluid. This unit may be employed as an auxiliary hydraulic take-off for other uses. 105

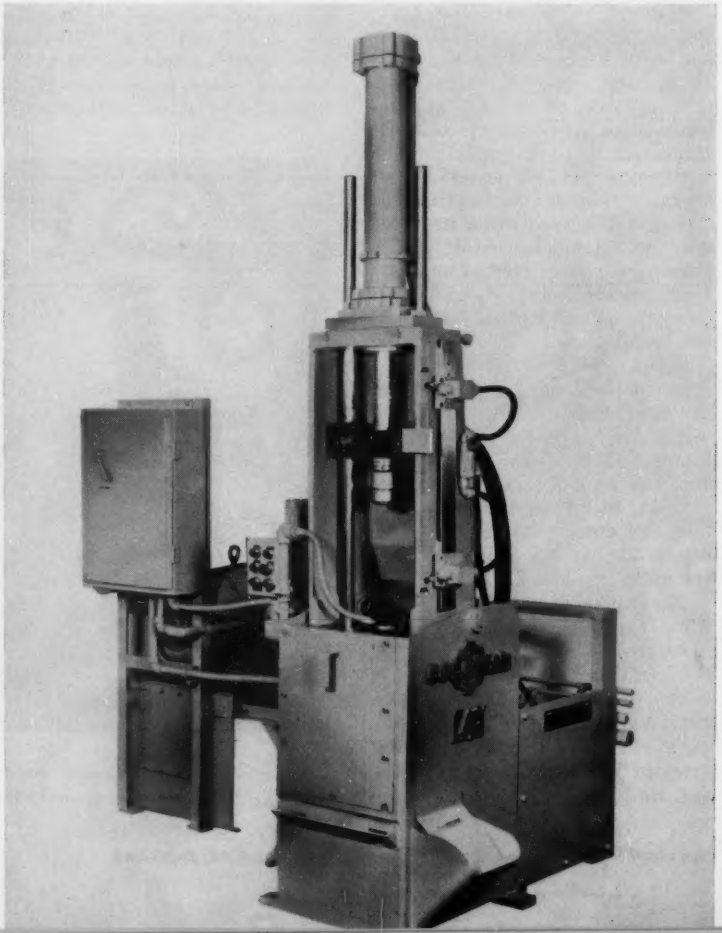
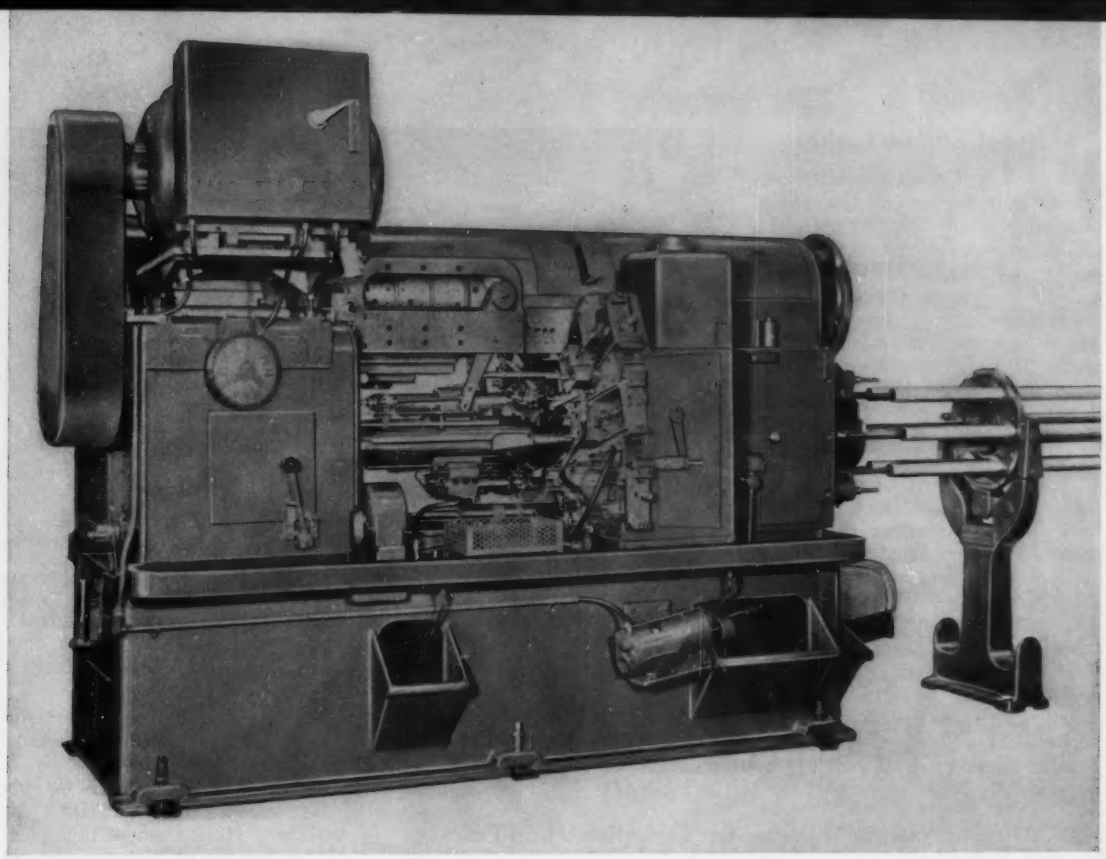


Fig. 2. Vertical position of Colonial "4" broaching machine adapted for push and pull-down broaching



Conomatic six-spindle bar machine has been announced by the Cone Automatic Machine Co., Inc.

Six-Spindle Conomatic Bar Machine

The Cone Automatic Machine Co., Inc. Windsor, Vt., has added the eleventh member to its group of currently available six-spindle "Conomatic" bar machines. This 1 5/8-inch Model TF Conomatic is also the sixth machine developed to facilitate quick set-ups and change-overs from one job to another. These automatics can be used on relatively short and medium runs, as well as on production runs.

Some of the features are a strong machine frame; a powerful motor drive; large diameter transmission shafts and bearings; large-diameter work-spindle carrier, with wide spindle spacing for cool spindle bearings; large-diameter main end slide, with 3 1/4-inch work center clearance for ample swing of tool-heads of special design, and for the accommodation of large tool and attachment holders; and a heavy main end-slide drive arm.

The machine has a minimum work cycle of 2.5 seconds and a maximum of 5 minutes, and an idle time of 1.7 seconds. Spindle speeds range from 128 to 2502 R.P.M. Calibrated dial adjustment is provided for the working strokes of the six independently actuated main cross-slides, main end slide, and opposed tool spindles, without change of total stroke or interference with positive stop settings, and also with a minimum of lost time for master cam changes.

Two auxiliary cross-slides are available. An open-end attachment spindle drive with independent speeds to opposed tool spindles can be mounted in any, or all, tool positions of the main end slide, with independent feeds for the opposed spindles in three positions of a single set-up. Adjustable and interchangeable heads are provided for opposed tool spindles. The standard mechanical stock feed has a maximum feeding length of 6 inches. Greater feeding lengths may be obtained by mechanical, air, or hydraulic means.

The swing type adjustable stock stop has coarse and fine threads, and can be removed when the machine is tooled for work requiring magazine loading. Fine-screw adjustments facilitate axial and radial setting of the cross-slide tool-holders. Provision is made for interchanging flat, dovetail, and circular type form-tool holders. Cross-slide and tool-holder design permits location of the tool cutting edges "on center" in alignment with the adjacent work axis. A two-base stock reel relieves the machine of the major load of extra length bar stock. 106

"Wear-Resist" Liners for Blast-Cleaning Equipment

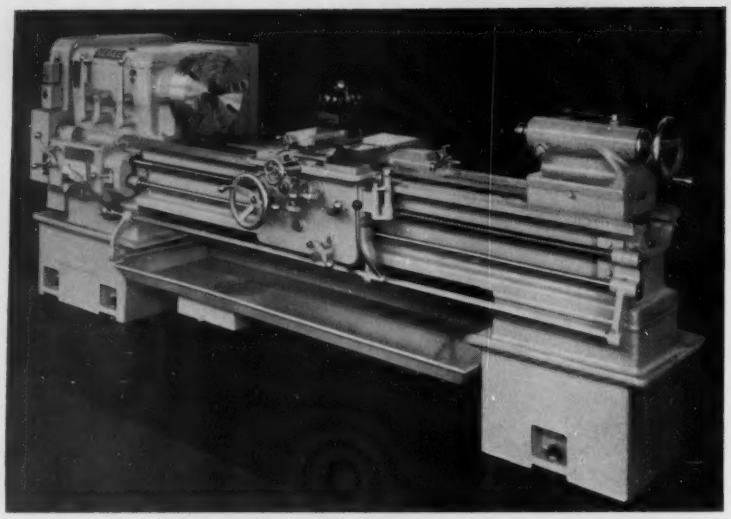
"Wear-Resist" liners, developed for better protection of parts subject to abrasive action, have been introduced by the Pangborn Corporation, Hagerstown, Md. The alloys in Wear-Resist liners, when heat-treated, are almost diamond hard. This hardness, in addition to a polished surface, gives excellent wear resistance.

Tests of this new hard alloy indicate that it is a real solution to the problem inherent in the blast-cleaning processes—rapid wear induced by the abrasive stream on any exposed parts. Although the alloy is more expensive than mild steel, its life is many times longer. Wear-Resist wear plates are available for Type GN Blastmaster barrels, and liners will soon be obtainable for other types of equipment. 107

Nebel Engine Lathe

A 16-inch 'LA' engine lathe, recently announced by the Nebel Machine Tool Co., Cincinnati, Ohio, is heavier, more powerful and of greater capacity than preceding models of this size made by the company. The headstock of the lathe has shaved and hardened gears throughout, larger Timken anti-friction bearings, short shafts, and wider gears. Helical drive gears assure a smooth, powerful drive.

This lathe will swing work 18 1/2 inches in diameter. The 6-foot bed machine has a distance between centers of 24 inches. It is built to accommodate a 7 1/2- or 10-H.P. main drive motor, and has twelve or twenty-four spindle speeds ranging from 13 to 750 R.P.M. The apron and carriage tailstock and spindle are also larger than on previous 16-inch models. The 'LA' series machine is also made in a 20-inch engine lathe size and in 16/27-inch and 20/30-inch removable block gap models. 108

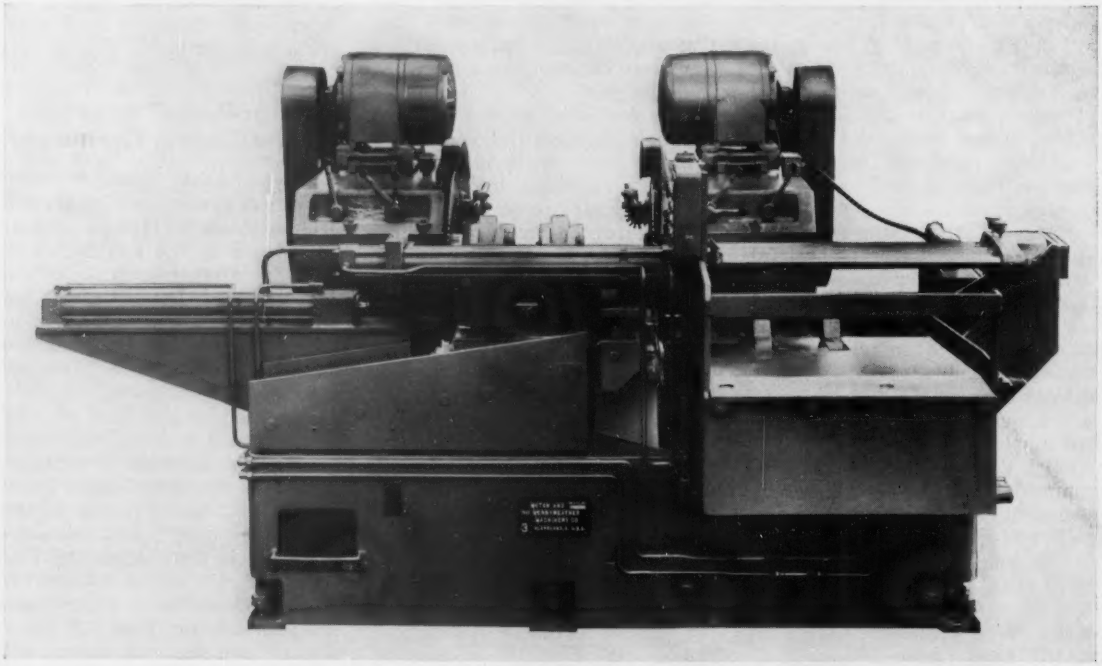


Engine lathe of improved design brought out by the Nebel Machine Tool Co.

Duplex Sawing Machine for Cropping Shell Ends

A machine supplied with two sawing heads, one right- and one left-hand, arranged for automatic, simultaneous cropping of both ends of an 8-inch shell forging, has been brought out by the Motch & Merryweather Machinery Co., Cleveland, Ohio. The sawing heads have nine spindle speeds, a multiple-disc clutch for engaging the spindle drive, and a self-contained lubrication system to all bearing points. Shell forgings are magazine loaded from a conveyor and individually passed into the loading position by means of an escape mechanism.

A hydraulically actuated loading ram pushes the shell into the clamping station where it is positively located at the nose of the cavity by means of a hydraulically operated rod. Overhead lever type clamps are then actuated to securely clamp the part in the machining position. The locating rod then withdraws from the shell cavity and the sawing heads are



Duplex sawing machine for cropping ends of shells made by the Motch & Merryweather Machinery Co.

For more information on these products, use Inquiry Card, page 243

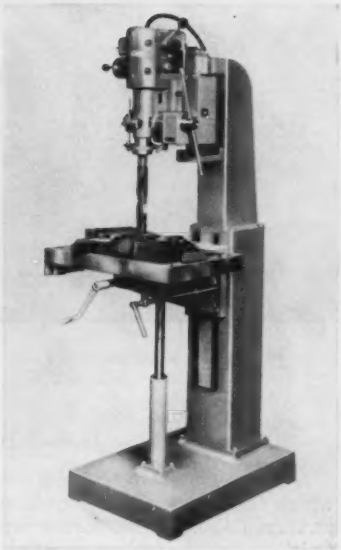
fed forward to cut the excess material from the base and nose ends of the shell forging. The saw heads then rapid traverse return to the starting position, the clamps open, and the hydraulically operated unloading mechanism transfers the finished shell into a roller type discharge chute. This automatic cycle continues as long as uncropped pieces remain in the loader. 109

H-P-M Plastics Injection Molding Machine

In certain classes of injection molded parts, such as table model radio cabinets, toys, refrigerator members, and housewares, which were formerly molded on 16-ounce equipment, there has been a trend toward larger size parts. To meet this trend, the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has announced a 20- to 28-ounce injection molding machine which was shown at the recent National Plastics Exposition.

In order to mold the larger parts at a faster rate, there is an increase of 60 per cent in the injection speed over that of the older 16-ounce machine and the horsepower has been increased from 30 to 50.

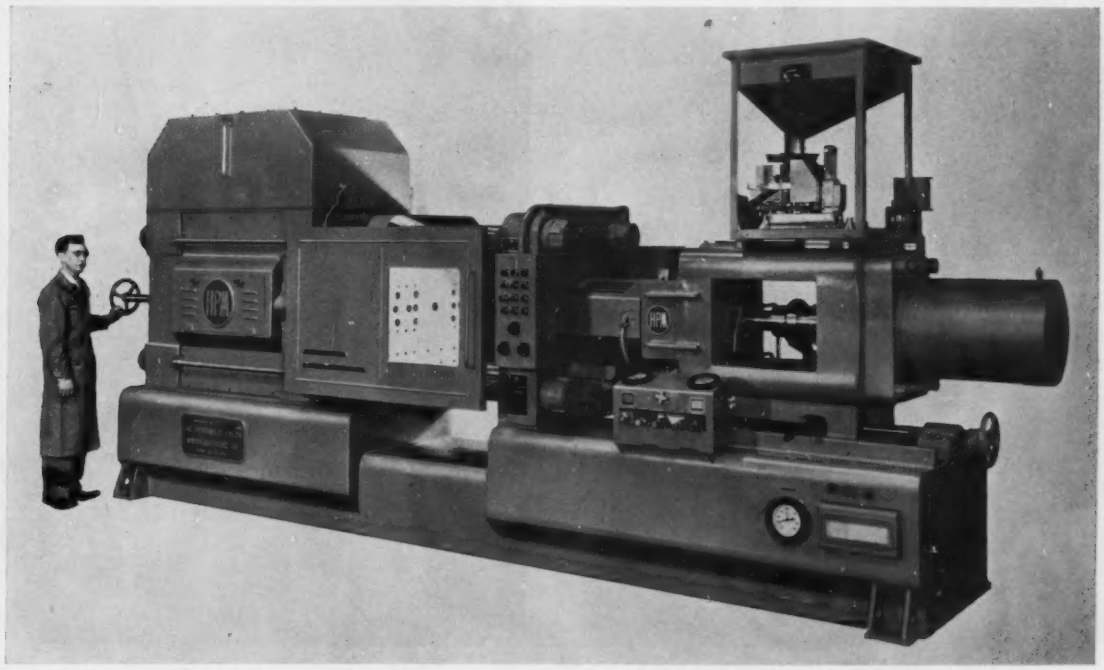
Instead of relying upon a volumetric type of unit to feed plastic granules into the heating chamber, the material is weighed accurately to obtain the correct amount for each molding by an automatic weighing feeder of the compensating type. The machine has a dual injection pump which permits two-speed injection or dual pressure injection. This operation is time-controlled and permits the injection pressure to be reduced automatically after the mold cavities have been filled. A small, high-pressure axial piston pump is employed in the new hydraulic circuit for developing maximum clamping pressure, and a high-capacity double-vane pump operates the clamp and injection rams. The plasticizing chamber is equipped with three heat zones, each pyrometer controlled. ... 110



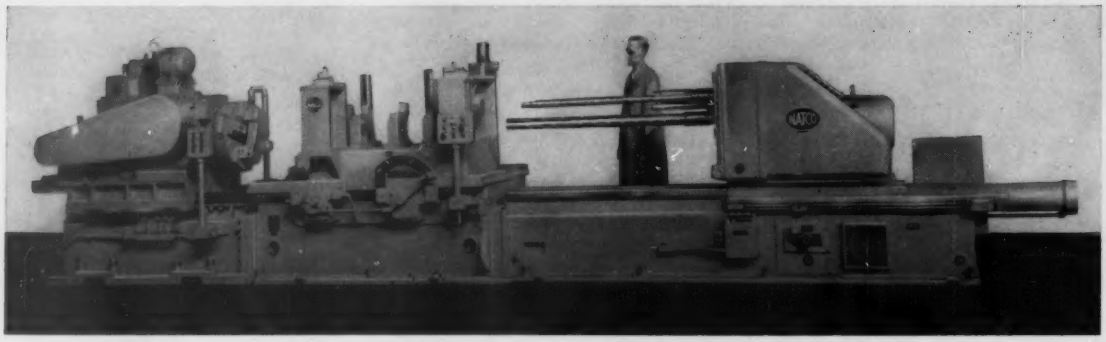
Box-column drill announced by the I. O. Johansson Co.

Johansson Box-Column Drill

A box-column drill with a swing of 30 inches has been announced by the I. O. Johansson Co., Skokie, Ill. This machine has a drilling capacity of 1 1/2 inches in cast iron and 1 1/4 inches in mild steel. It is ruggedly constructed for the handling of large, heavy workpieces. A geared drive provides adequate power at any of the eight spindle speeds, which range from 125 to 1540 R.P.M. The combined spindle travel and vertical adjustment of the head totals 8 1/2 inches. Maximum distance from the spindle to the table is 28 inches and minimum distance is 3 1/2 inches. The spindle has a No. 3 Morse taper. 111



Plastics injection molding machine of increased capacity placed on the market by the Hydraulic Press Mfg. Co.



"Boreface" machine for rapid processing of Diesel engine blocks made by National Automatic Tool Co.

Natco "Boreface" Machine for Processing Diesel Engine Blocks

A new "Boreface" machine which features simultaneous cam- and crank-hole finish-boring and finish-facing operations on Diesel engine blocks has been announced by the National Automatic Tool Co., Inc., Richmond, Ind. This machine employs two heads to finish-bore the cam- and crank-holes and bore and cross-feed face the flywheel case simultaneously at the rate of 4.3 parts per hour.

The straight alignment bores are held to extremely close tolerances with respect to size and positioning. The finished face on the flywheel housing and the cover is held square with the crankshaft bore to within 0.0025 inch, total indicator reading.

The right-hand head finish-bores seven in-line main bearings, an oil-retainer hole and cover, four in-line camshaft bearing inserts, and two additional holes. At the same time, the left-hand head rough-bores, semi-finish and finish bores, and cross-feed faces the flywheel housing and cover. . . 112

Gleason Quenching Presses Designed to Minimize Distortion of Hardened Parts

Accurately controlled quenching of round, flat, or irregular parts can be accomplished on a series of quenching presses brought out by the Gleason Works, Rochester, N. Y. These presses will be exhibited at the National Metal Exposition in Chicago from November 1 to 5. They are designed to hold and align heated parts during the quenching process, so that they may be hardened with a minimum of distortion. The quenching cycle is completely automatic, preset by the operator.

In operation, the quenching oil is forced uniformly over and around the heated part. The rate



Fig. 1. Gleason quenching press designed to handle flat parts, with the ram in the quenching position

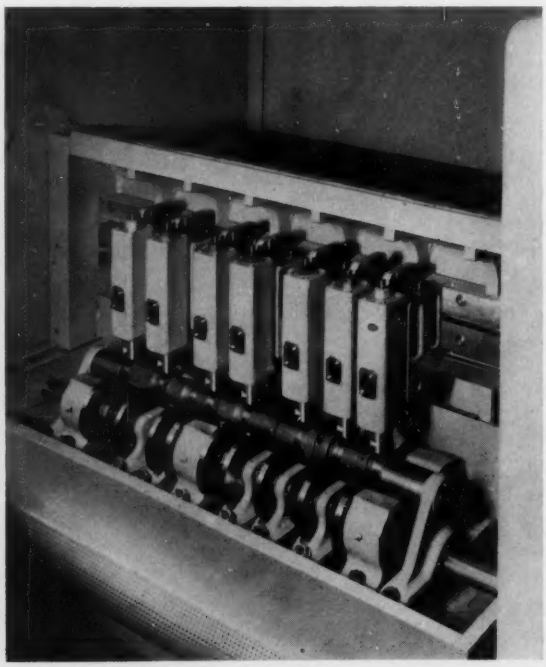


Fig. 2. Close-up view of shaft located in a Gleason rolling quench machine

For more information on these products, use Inquiry Card, page 243

of flow can be accurately controlled at all stages of the quenching cycle. Thus, it is possible to obtain a rapid initial quench until the critical hardening temperature is passed. This is followed by a slow quench to allow the temperatures throughout the section to become equalized and permit the material to cool without developing internal stresses. Finally, a rapid cooling quench is applied to bring the temperature of the part down to the point where it can be handled.

Each quenching press has a built-in pumping system and oil reservoir. Any of the machines can be arranged to use water, caustic soda, or other quenching medium, if desired. The Gleason No. 26 quenching press, with the ram in the quenching position, shown in Fig. 1, is available in three sizes to accommodate parts having a maximum dimension of 36 inches. In these presses, the heated part is held between two dies while the quenching takes place. Ring parts are held round and concentric by the expansion of an assembly of segments within the bore or by contraction on the outside diameter.

The Gleason rolling quench machine, for quenching shafts or similar parts, operates by rolling the part under pressure during the quenching cycle, so that hardening is achieved with a minimum of distortion. Roller pressures are pre-set by the operator, and are automatically controlled. The direction of flow of the quenching fluid, and the volume, up to 350 gallons per minute, also can be adjusted for each job. A close-up view of a shaft in position for quenching in one of these machines is shown in Fig. 2. A rolling quench machine of this type will handle shafts or other similar parts from 9/16 inch to 4 inches in diameter, and from 6 to 43 inches in length. Parts with integral gears, cams, or shoulders up to 8 inches in diameter can be accommodated. 113

Three-Way Automatic Broaching Machine

An automatic hydraulic broaching machine of the vertical three-way type has been built by the American Broach & Machine Co., Ann Arbor, Mich., to broach the inside diameter of laminated stators for electric motors. Designed to fit into a conveyor line, the machine features an automatic loading and ejection mechanism that makes it possible to run the machine on a continuous automatic cycle.

Parts coming into the machine on the conveyor line are shuttled into the broaching position by a hydraulic cylinder that is interlocked to the machine cycle. A broach retriever lowers the broach shank, or arbor, through the part until it connects with the automatic pull-down head. The broach is then pulled down through the part, finishing the inside laminated surfaces of the stator.

With the broach in the down position, free of the part, a second hydraulic cylinder ejects the part from the broaching position onto the conveyor line. The broach is then returned to the retriever, which raises it to the starting position, thus completing one cycle.

Tooling includes broach shells of various sizes for broaching similar stator parts. The broach retriever is mounted on its own ways, separate from the machine slide, and is designed with extra stroke capacity to follow the broach through the principal portion of the broaching stroke. Under ideal conditions, a production rate of over 200 parts per hour can be maintained 114

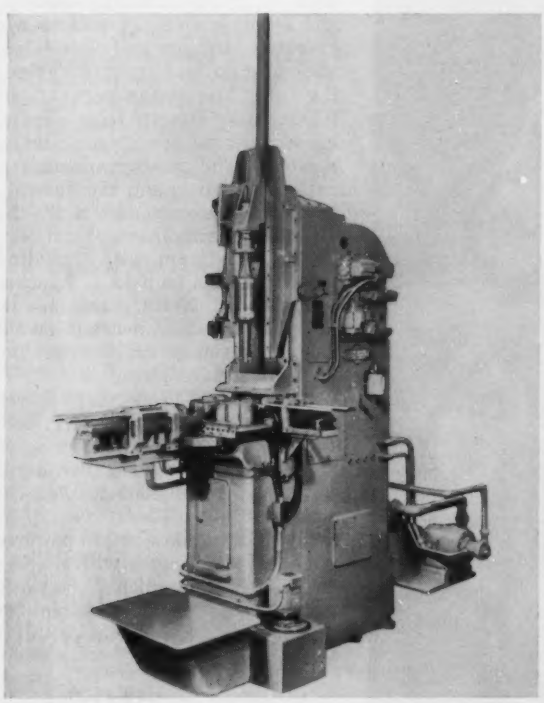


Fig. 1. Three-way automatic broaching machine brought out by the American Broach & Machine Co.

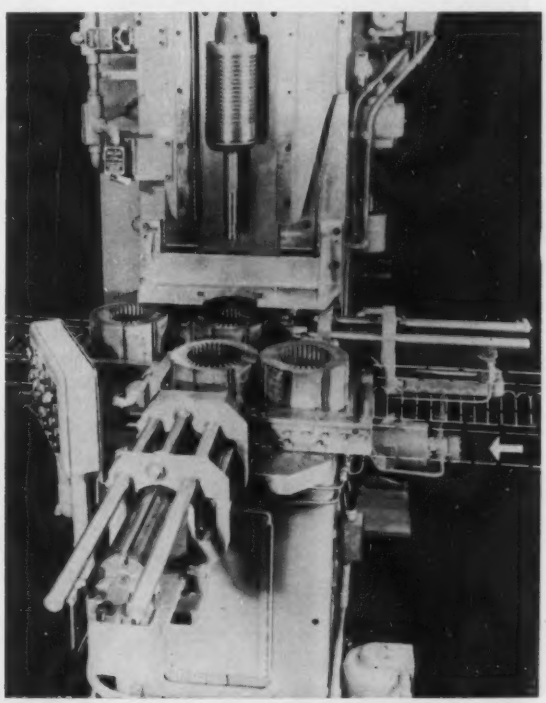
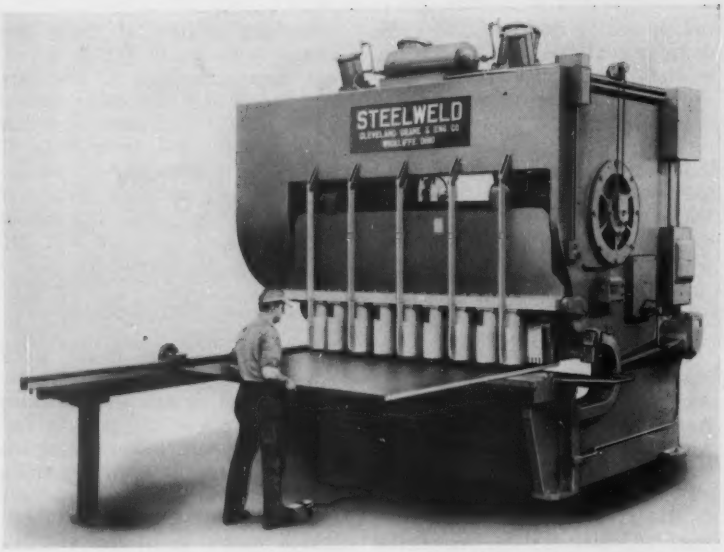


Fig. 2. Close-up view of work and transfer mechanism of machine shown in Fig. 1



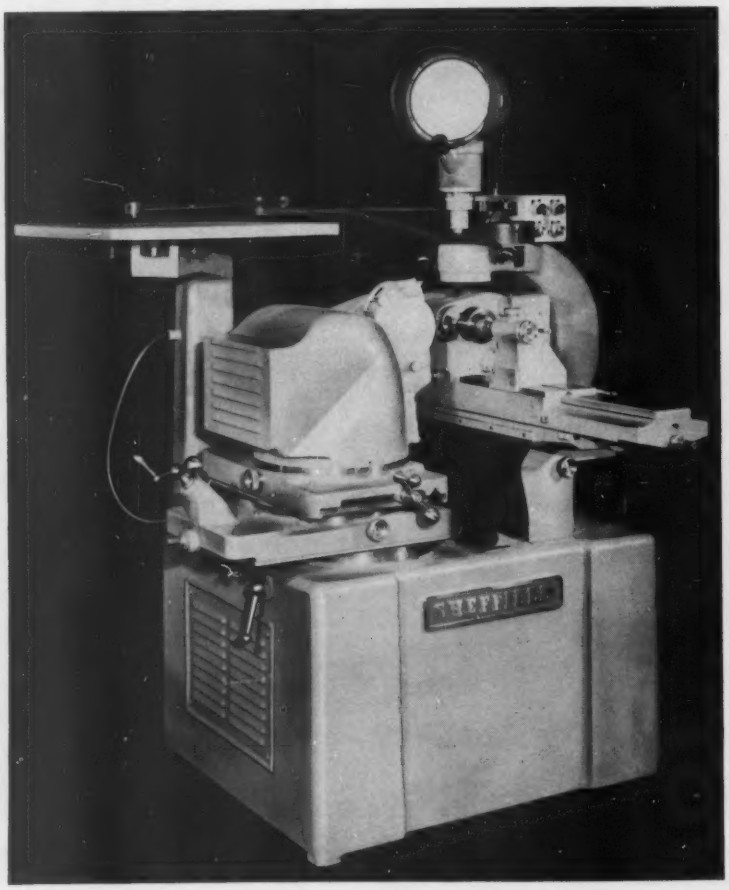
Steelweld heavy plate shear built by the Cleveland Crane & Engineering Co.

Steelweld Heavy Plate Shear

A Steelweld shear, designed for production shearing of steel plate in sizes up to 8 feet long by 1 1/2 inches thick, has just been completed by the Cleveland Crane & Engineering Co., Wickliffe, Ohio. This Model No. 24G-8 machine operates on the pivoted-blade principle, the blade traveling in a circular path without the use of guides and slides.

The clutch and brake unit is air-operated, and designed to permit long, continuous runs of shearing without overheating. The unit is unusually fast-acting and provides quick, positive clutching and braking with very little slippage.

The shear is equipped with a micro-set knife adjustment which makes it easy to adjust knife clearance to suit the thickness of metal being cut. This adjustment is said to make possible sharper, burr-free cuts, and to reduce wear on the knives. The operating speed is twenty-two strokes per minute. Adjustments are provided to enable slitting and notching. . . 115



Micro-Form grinder for cylindrical work placed on the market by the Sheffield Corporation

Sheffield Micro-Form Grinder

The Sheffield Corporation, Dayton, Ohio, is now manufacturing a special-purpose Micro-Form grinder for grinding surfaces of cylindrical work and circular form tools up to 8 inches in diameter and 8 inches in length, although work up to 10 inches in diameter by 9 inches in length can be swung between centers. This Model No. 123 machine can be used to grind forming, beading, and seaming rolls, as well as for grinding intricate and close-tolerance profiles on Crushtrue grinding rolls. The design permits finish-grinding directly from a drawing without the use of templates or masters. The pantograph has a ratio of 50 to 1, and the drawing table will accommodate a 20- by 20-inch drawing.

The maximum size grinding wheel that can be used is 7 inches in diameter. Neither the spindle nor the work-head needs to be adjusted vertically as both are located in a fixed plane.

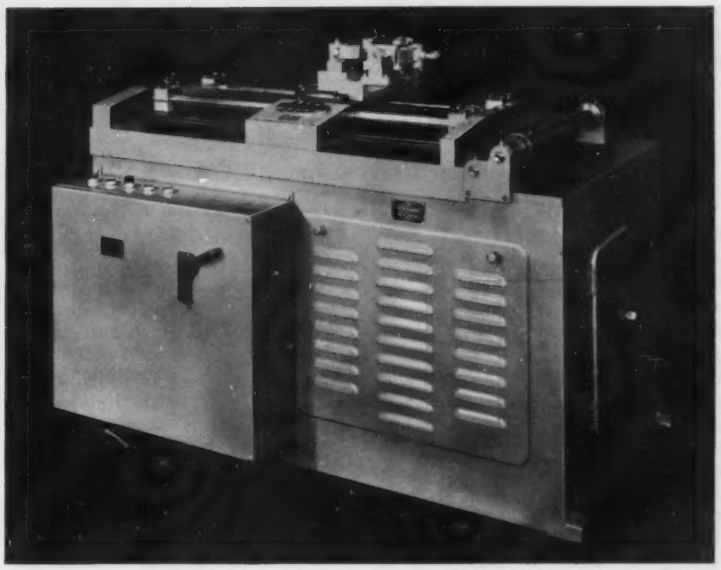
The wheel-head is driven through a V-belt by a 1-H.P. ball-bearing motor running at a speed of 1750 R.P.M. which provides a spindle speed of 3000 R.P.M. The gear-driven work-head is equipped with change-gears and is powered by a 1/3-H.P. motor with a speed of 1800 R.P.M. which gives work-head speeds of from 40 to 360 R.P.M. 116

For more information on these products, use Inquiry Card, page 243

Cabinet-Mounted Motor-Driven Slide Feed

A cabinet-mounted motor-driven slide feed is a recent addition to the line of automatic press-room equipment made by the U. S. Tool Company, Inc., Ampere (East Orange), N. J. This Model No. SFC-24-24 slide feed will handle material up to 24 inches in width. The feeding length is adjustable up to 24 inches at one stroke. Feed lengths over 24 inches can be obtained by means of a counting unit, which is furnished as part of the equipment. To obtain a feed of 40 inches, for example, the feed itself is first adjusted to provide a feed of 20 inches at one stroke. The counter is then pre-set to allow the feed to make two strokes before tripping the press.

Since this is an individually motor-driven unit, there are no mechanical connections to the press, and the feed can be used with practically any type of press. The air-operated gripper mounted in the feed block and the air-operated check are both electrically controlled. A control is provided for inching material into the dies and there is a manually-operated push-button for single tripping of the press. The counter for cycle feeding can be pre-set to allow the feed to make a predetermined number of strokes (up to 400) before the press is tripped. After making the strokes, the feed stops, the press trips, and the counter resets itself. Power is provided by a 3-H.P. motor having an electric clutch and brakes. 117



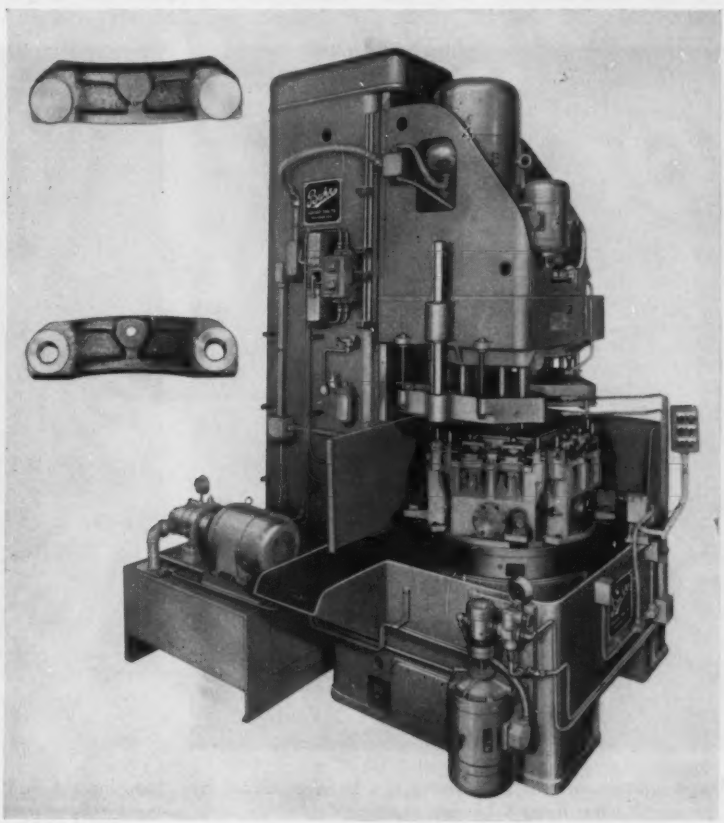
Motor-driven slide feed for press brought out by the U. S. Tool Company, Inc.

Buhr Special Automatic Indexing Machine

Fully automatic hydraulic clamping is one of the features of a special indexing machine recently built for a large automotive manufacturer by the Buhr Machine Tool Co., Ann Arbor, Mich. This five-station machine is designed to permit loading four parts in each station and has a production capacity of 670 pieces per hour. It has a special combination drilling and tapping head which features an independent lead-nut plate.

All multiple heads are of Buhr ball-bearing construction with shaved gears and broached-and-splined drives. The tapping spindles are of the lead-screw type with precision-ground and hard chromium-plated threads. Automatic indexing is electrically controlled, and of the cam-and-roller type designed to assure uniform acceleration and deceleration of the indexing movement.

Hydraulic and electrical installations are designed to J.I.C.



Buhr special automatic indexing machine, with views of work before and after machining

standards. Other standard Buhr features, such as hardened-and-ground laminated tool-steel ways, are incorporated in the design. Interchangeability of machine parts that are held to close tolerances and precision-bored holes for locating dowels of all component assemblies insure alignment of all machine members. . . . 118

Jones & Lamson Extra Capacity Comparator

The Jones & Lamson Machine Co., Springfield, Vt., is now producing a special optical comparator with a 30-inch screen for inspecting very heavy parts, such as aircraft propellor blades, gang milling cutters, and saws. Blanking, forming, coining, rolling, and seaming dies, as well as castings and other large parts that are made to extremely close tolerances, can also be inspected. This comparator has a milling machine type base and table. Ample clearance is provided for loading and unloading work by means of a crane.

Work having a maximum diameter of 12 inches and length of 20 inches may be held between centers on a 42-inch table. A 32-inch table is available which allows parts 10 inches in length to be staged when using 12-inch diameter centers. The horizontal measurement range is 16 inches and the vertical range, 6 inches. Electrically controlled power elevation is provided to facilitate operation.

Standard projection lenses ranging from 10 to 100 magnifications are available to suit a wide range of job specifications. A J & L high-intensity reflection attachment and coordinate slide tracing attachment are valuable additions to this equipment. . . 119

Machines for Welding and Broaching Transmission Bands

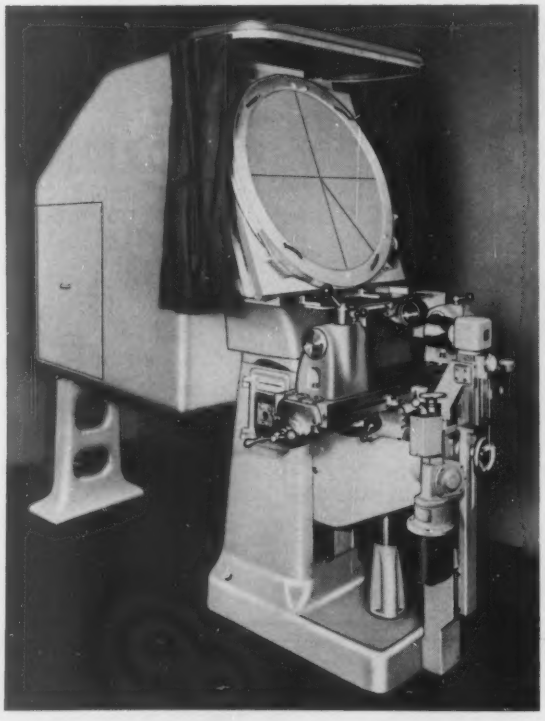
The Swift Electric Welder Co., Detroit, Mich., has announced a special two-machine process for the welding and trimming of transmission bands. The welding machine welds the band to the forging while a vertical broaching machine at one side performs the trimming operation. The welding machine has a 75-kva transformer, a motor-driven cam for applying push-up pressure, air-operated clamps, and geared automatic flash and upset timing equipment.

The vertical broaching machine is operated by a self-contained hydraulic system. The multiple-tooth broach trims the part practically to gage size, or it can be set to take an under-cut. Flash is removed while the metal is still hot to prolong tool life.

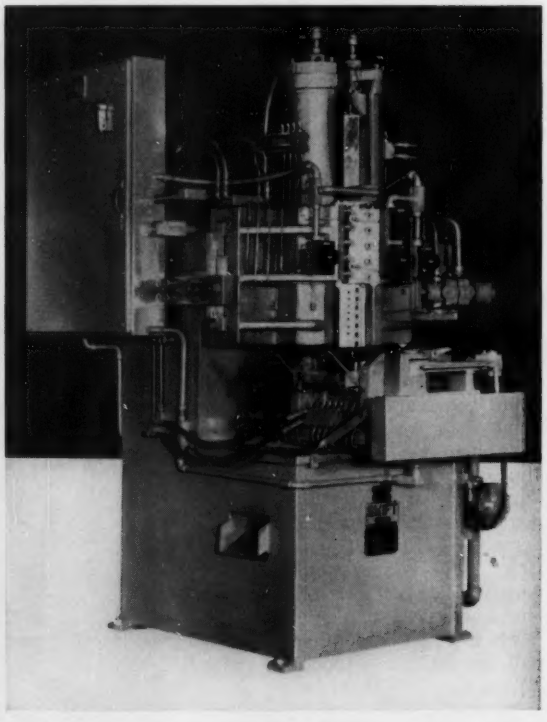
The transmission band is approximately 2 inches wide by 1/8 inch thick and is welded to a forging in two places. A production line of two welders and two trimmers is commonly employed. The first weld is made and trimmed, and then the second weld. Although these machines have been especially developed for welding bands used in automatic transmissions, they are also adaptable for other welding applications. . .120

Special Roller Bearing for Pump Cylinder Barrel

The Rollway Bearing Co., Inc., a subsidiary of the Lipe-Rollway Corporation, both of Syracuse, N. Y., in collaboration with the Denison Engineering Co., Columbus, Ohio, has developed a special

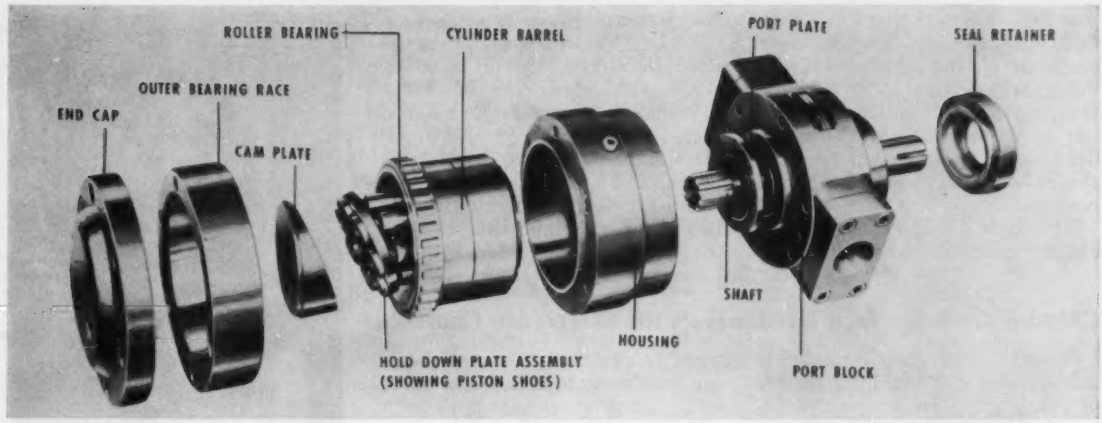


Large-capacity optical comparator has been produced by the Jones & Lamson Machine Co.



Machine for welding transmission bands to forgings made by the Swift Electric Welder Co.

For more information on these products, use Inquiry Card, page 243



Exploded view of Denison pump showing application of special Rollway cylindrical roller bearing

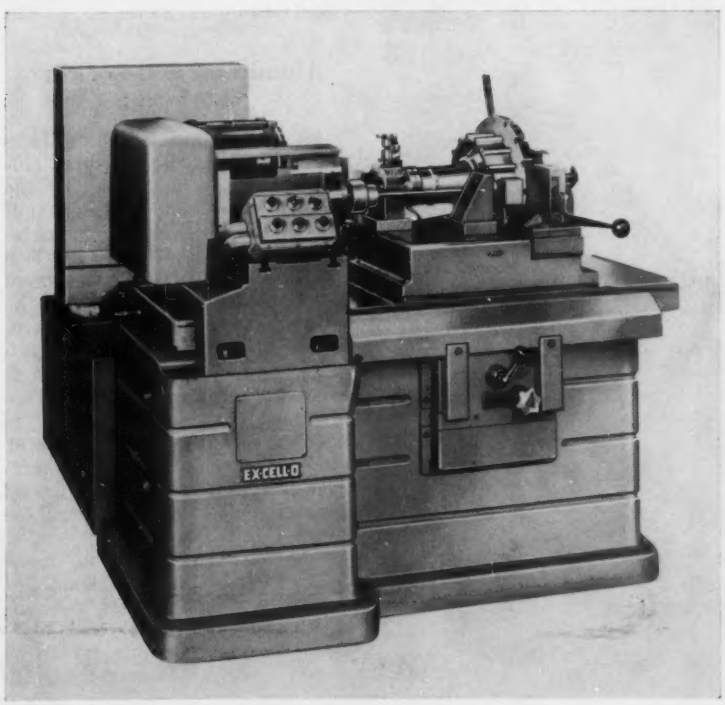
cylindrical bearing which is being used in several series of Denison pumps of the axial piston, constant displacement type. This bearing is a modification of the Rollway "MCS" type roller bearing series and is incorporated in the pump assembly as shown in the illustration.

This bearing consists of a separable cylindrical outer race and a channel type inner race, using crowned rollers held in place and guided by a bronze retainer. It differs from the usual "MCS" roller bearing in that its inner and outer races have been modified to suit the pump assembly. The outer race forms a part of the pump housing with machine screws inserted through the holes in the race, firmly holding it in position.

The load-carrying capacity varies, of course, depending upon the size of the bearing. The bearing shown has a rated capacity of 8625 pounds at 2000 R.P.M., is about 10 1/4 inches in diameter, and supports the cylinder barrel of a No. 800 Denison pump. . .121

Ex-Cell-O Precision Boring Machines Equipped with Gun Type Drills

Precision boring machines made by the Ex-Cell-O Corporation, Detroit, Mich., are being equipped with gun type drills for the application of the company's "Bor-Dril" method of machining holes from the solid. This method is especially suited for producing either holes that are too long to be bored by conventional methods, or holes difficult to drill to specified size. The machines can be arranged for either horizontal or vertical operation.



Ex-Cell-O precision boring machine equipped to "Bor-Dril" aircraft part

In the "Bor-Dril" process, the drills usually rotate while the work remains stationary. This arrangement has two important advantages. First, the part can be any size or shape. Second, since the part does not rotate, it can be clamped in a simple fixture instead of in a chuck. However, on small symmetrical work-pieces it may be more practical to rotate the part instead of the drill. In "Bor-Dril" operations, like any process using gun type drills, coolant oil must be forced through the drill under high pressure to carry away chips through the single flute and dissipate heat.

The Ex-Cell-O machines available for application of the process are of rigid design, have smooth easily adjusted feeds and vibration-free spindles capable of rotating either the drill or the part at high speeds, and are adaptable for multiple-spindle arrangements. Two or more spindles can be

For more information on these products, use Inquiry Card, page 243

mounted on one bridge to "Bor-Dril" parallel holes in one or more parts. If center distances of the holes are too close to permit this type of set-up, an indexing fixture can be used, or the work can be done on a double-end machine, the holes being machined from both ends.

The Style 112-C Ex-Cell-O precision boring machine shown in the illustration is equipped to "Bor-Dril" fifteen holes from the solid in aircraft parts made of S A E 4340 steel. The holes are 1/2 inch in diameter and 3 3/8 inches long. Limits on hole diameters and location are held to plus or minus 0.001 inch. The machining time is four minutes per hole. This machine is shown with the splash guards removed. . . 122

Gleason Gear Surface Hardeners with Electronic Controls

A sensitive electronic control is a feature of the improved models of gear surface hardeners now being produced by the Gleason Works, Rochester, N. Y. The Gleason No. 1 gear surface hardener and electronic control unit shown in Fig. 1 will be exhibited at the National Metal Exposition in Chicago from November 1 to 5. These machines are so designed that the heating flames traverse each individual tooth separately.

A sensitive radiation pyrometer, which may be seen in Fig. 2, is focussed directly on the tooth being heated, and receives energy from the hot metal. An electronic balancing mechanism translates that energy into forces which control the travel of the burners along the tooth. Operation of the machine is entirely automatic after the optimum hardening temperature is pre-set by the operator and the machine started. This equipment is designed to assure heating each tooth to the correct hardening temperature so that all teeth of a gear and of all gears in a lot will be of uniform hardness.

A wide variety of steels, both forgings and castings, can be surface hardened. With this method of hardening there is said to be no measurable distortion and the region of hardness is limited to the wearing surfaces.

In normal operation, the gears are indexed so that non-adjacent teeth are hardened successively to eliminate the possibility of a change in bore diameter during the hardening operation. The self-quenching nature of this method is said to minimize stresses. However, oil- or water-quenching under accurately controlled conditions can be employed, if desired. Special burners with cooling orifices can be used for hardening coarse pitch teeth.

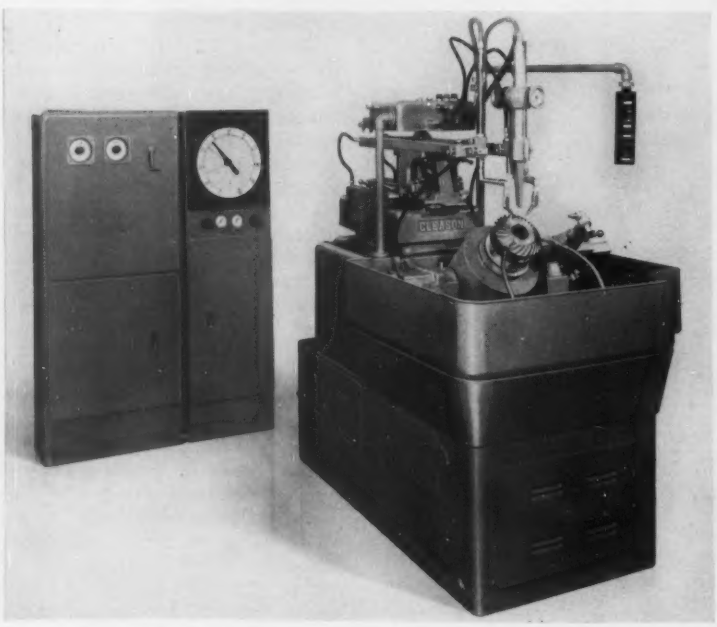


Fig. 1. Gleason gear surface hardener, with electronic control unit at left

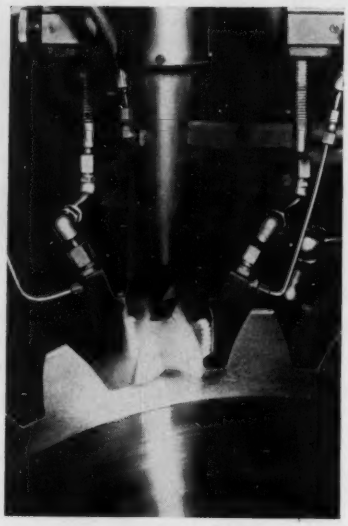


Fig. 2. View of Gleason gear surface hardener flame in action

The hardeners are adaptable to hardening teeth of straight bevel, spiral bevel, Zerol, spur, herringbone, or helical gears. The No. 1 machine takes bevel gears with pitch diameters up to 24 inches, spur and helical gears up to a pitch diameter of 30 inches, and internal gears having outside diameters up to 24 inches. The No. 2 machine takes gears having pitch diameters up to 120 inches. . . 123

Aluminum Self-Locking Lock-Nut

An all-metal, self-locking locknut of high-tensile strength aluminum has been added to the "SPS Flexloc" line of the Standard Pressed Steel Co., Jenkintown, Pa. This one-piece 105 F S nut is made of 24S-T aluminum and is said to meet or exceed the minimum tensile strength requirements of a standard all-steel nut, yet weighs 65 per cent less. It is especially suited for aircraft structural assemblies and is adapted for use on steel bolts or studs in place of steel nuts whereever weight is a factor and temperatures do not exceed 250 degrees F.

The nut is designed to Specification AN-N-5b, is chemically treated against corrosion to Specification MIL-C 5541, and blue-dyed for identification. It can be re-used without loss in locking efficiency, and is available in five sizes ranging from 6-32 to 5/16-24. 124

For more information on these products, use Inquiry Card, page 243

Snyder Trunnion Machine for Processing Axle Housings

An automatic, four-station, vertical trunnion machine designed for processing automobile rear-axle housings through the use of high-speed cutting tools has been built by the Snyder Tool & Engineering Co., Detroit, Mich. The work fixtures of this machine are mounted on a trunnion which is rotated upon a vertical center. The drive for the trunnion is an index-and-reset mechanism actuated by a Hydro motor. The three heads are mounted on three separate wing bases which are bolted to the central base upon which the trunnion assembly is mounted.

In loading, the rear-axle housing is located in the work-holding fixture by means of a targeting device which is swung into position at the first station. Various clamps and locators in the fixture are then adjusted and locked, after which the targeting device is swung clear so that the trunnion may be indexed.

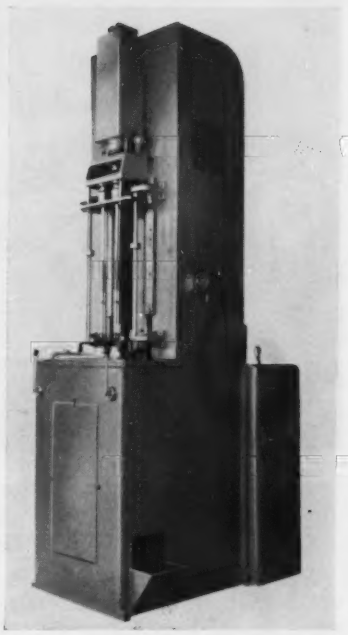
At the second station, the carrier mounting flange is rough- and finish-faced by a scroll type facing head. At the third station, ten holes around this flange are combination drilled and countersunk; and at the fourth station, the pilot diameter in the carrier mounting face and a clearance hole in the rear face are bored at same time.

A notable feature of this machine is the high speed at which the boring and facing tools are operated—carbide tools cutting at 900 and high-speed steel tools at 283 surface feet a minute. The machine requires a floor space 212 by 126 inches and has a production rate of eighty pieces an hour when operating at 75 per cent efficiency. 125

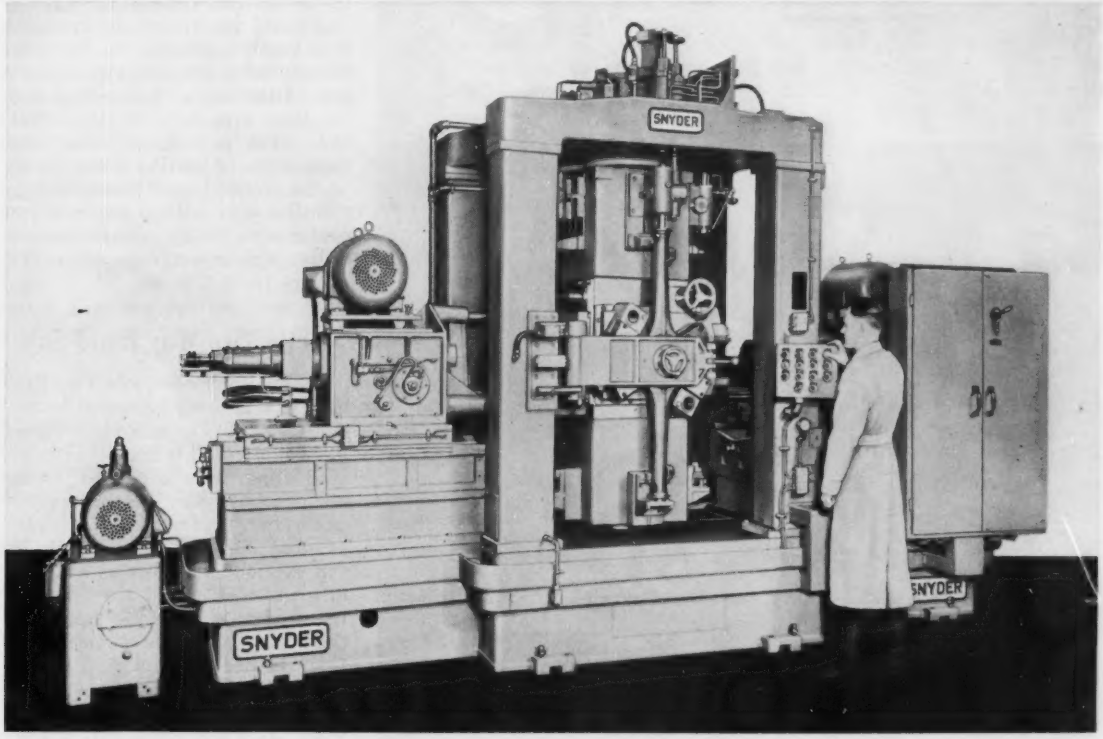
Acme Internal Broaching Machine

A vertical pull-down internal broaching machine recently announced by the Acme Broach Corporation, Milan, Mich., is being offered in various capacities from 6 to 30 tons and in stroke lengths from 36 to 60 inches. Travel speeds of both the cutting and broach retriever cylinders are variable by means of speed control valves. Each cylinder has its own self-contained hydraulic circuit.

The machine shown is arranged to broach a round bore and a single keyway in four die-castings at a time, producing approximately 520 finished pieces per hour. This machine can readily be tied in with an automatic feed in a production line. 126



Acme vertical pull-down internal broaching machine



Trunnion type automatic machine for processing axle housings brought out by Snyder Tool & Engineering Co.

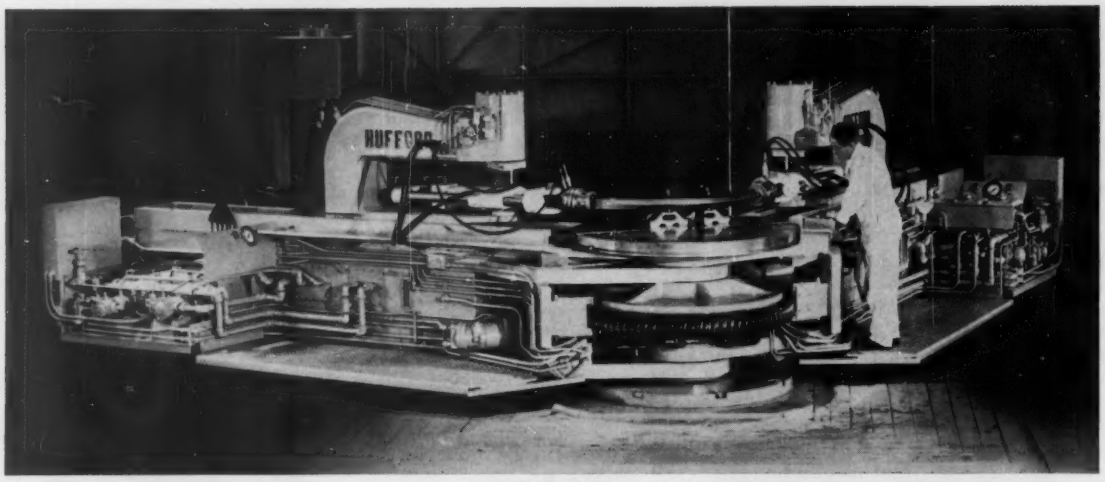


Fig. 1. Versatile stretch-wrap forming machine announced by the Hufford Machine Works, Inc.

Hufford "Carousel" Stretch-Wrap Forming Machine

A stretch-wrap forming machine of radically new design, designated the "Carousel" because the operator rides either arm during the forming operation, has been announced by the Hufford Machine Works, Inc., El Segundo, Calif. This machine is capable of producing many parts that cannot be formed with a single arm machine. It has a full 360-degree arm rotation and will form all conventional parts from both extrusions and sheets up to 22 inches wide.

The Carousel has been designed by Hufford in conjunction with the Douglas Aircraft Co., El Segundo Division, to expedite the production of parts now requiring forming operations on several different machines. In addition to its 360-degree arm rotation around a stationary die and table for complete circle forming, the Carousel also permits the stretch-wrap forming operation to be complemented by the simultaneous application of a roller or wiper. This roller is attached to one of the rotating arms. It can be operated clockwise or counter-clockwise and can be applied to the work as many times as necessary. Other operations include bulldozing, joggling, stretch-straightening, and forming reverse bends and "S" curves.

All tension cylinders are double-acting and will apply either tension or force to the work. Since they swivel 360 degrees within their brackets, either end of a cylinder can be utilized to apply force. Tension cylinders on the rotating arms are adjustable for height, permitting dies to be set at any level. Work-pieces can then be lifted or lowered to coincide with the die height.

A novel feature of the machine is a tension cylinder on the stationary table top for gripping one end of the work while using one rotating arm to grip the other end. This permits simultaneous application of tension at both ends of the work-piece. The remaining rotating arm is thus released for performing such operations as rolling and ironing. 127

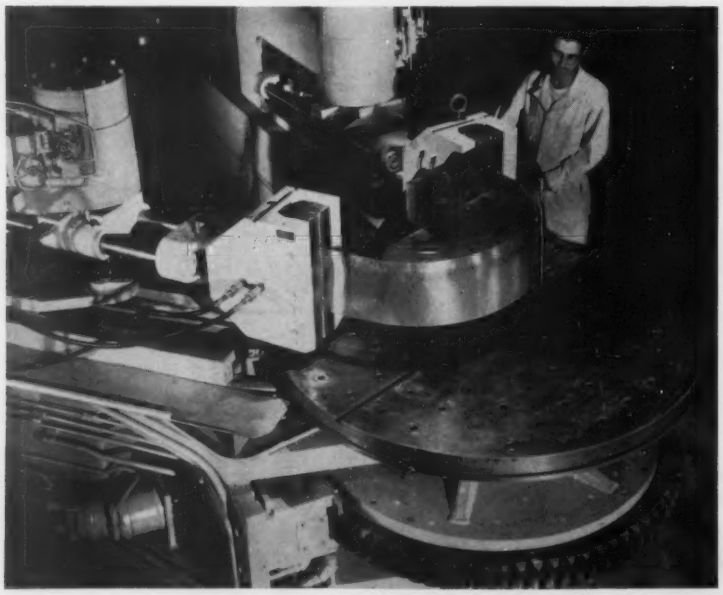


Fig. 2. "Carousel" stretch-wrap forming machine set up for forming wide sheets

Wells Two-Way Band Saw

A dual-purpose metal-cutting band saw is being marketed by the Wells Mfg. Corporation, Three Rivers, Mich. This machine can be used either as a horizontal or an upright band saw. Its portability and versatility make it especially adapted for the small shop, or "on the job" work, or as a utility unit in large shops. No tools are required to change the saw from the horizontal to the vertical position. In the vertical position, it can be used for cutting notches, slots, angles, bevels, or contour work. As a horizontal cut-off saw, it has a capacity for cutting rec-

For more information on these products, use Inquiry Card, page 243

Wells band saw adapted for use in either horizontal or vertical position

tangular pieces 3 1/2 by 6 inches and round bars 3 1/2 inches in diameter. The blade is 1/2 inch wide by 0.025 inch thick by 5 feet long and is driven by a 1/4-H.P. motor. The V-belt drive has selective speeds of 54, 100, and 190 feet per minute. 128

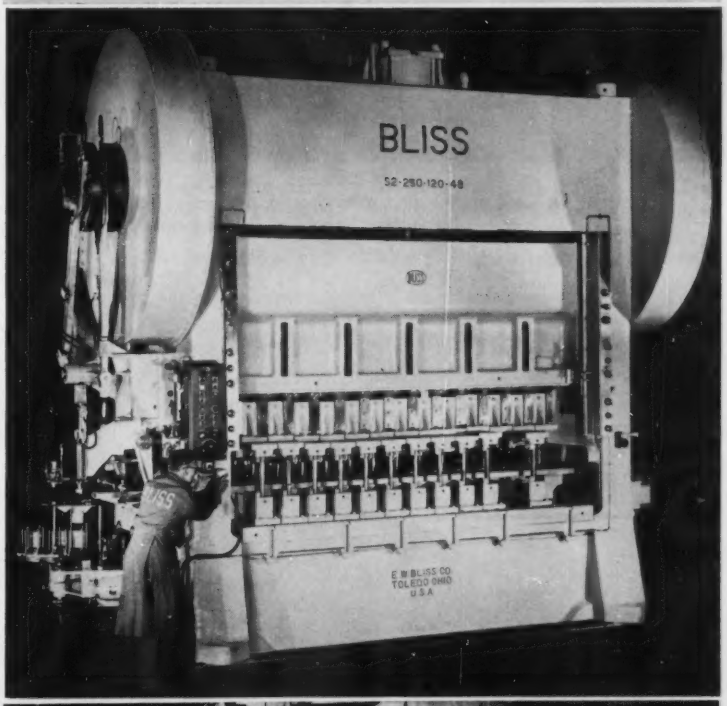
Huge Bliss Press and Special Stacking and Feeding Equipment

A huge 250-ton, thirteen-station transfer press is the thousandth press built by the E. W. Bliss Co., Canton, Ohio. The latest press, equipped to produce twenty-eight starter brush end plates per minute, was installed recently in the Ypsilanti, Mich., plant of the Ford Motor Co. A special blank stacking and feeding device seen at the left of the operator, Fig. 1, and in the close-up view, Fig. 2, is an outstanding feature of this machine. Other features include an improved slide bar and finger transfer mechanism and electric controls.

Only one operator is required to keep the six stations of the stacking and feeding turret filled with blanks. A plunger with a rubber vacuum cup picks up a pre-cut blank from a stack and delivers it to the feeding fingers. If the plunger fails to deliver a blank, a limit switch stops the press. As the supply of blanks is exhausted, a limit switch is tripped, causing an elevator to push a new stack of blanks into the feeding position. When the elevator descends, it trips a switch which starts a motor that indexes the next full station of blanks into place.

Although this press was designed for automobile production lines, it can be used to produce a wide variety of stampings. It is of the straight-side double-crank type with single geared twin drive. The bed is 120 by 48 inches. A 50-H.P. adjustable speed driving motor permits varying the speed from fourteen to twenty-eight stampings per minute. 129





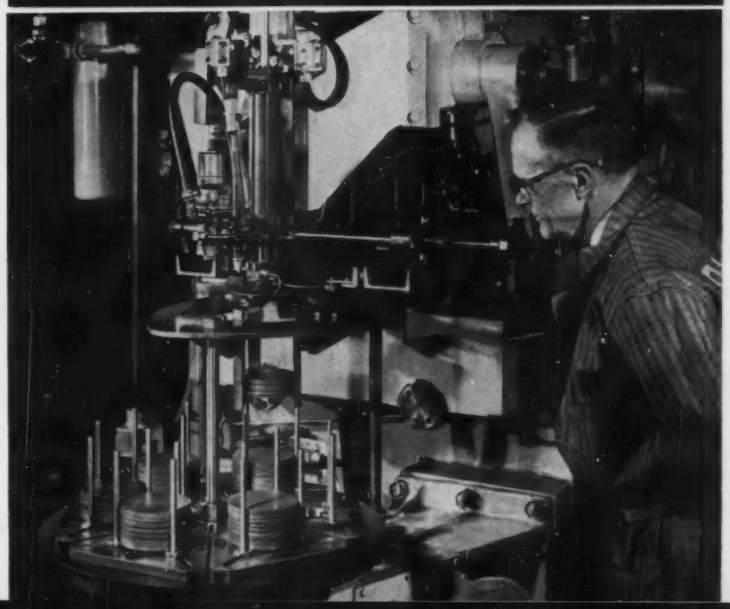


Fig. 1. (Center) Huge transfer press recently built by the E. W. Bliss Co.

Fig. 2. (Right) Six-station blank-holder and automatic feeding mechanism of press shown in Fig. 1



Electronic unit for gaging and sorting cylindrical roller bearings brought out by Federal Products Corporation

Roller Bearings Gaged and Sorted Electronically

A completely automatic, hopper-fed, electronic gage, which is designed to measure the over-all length and outside diameter of highly polished cylindrical roller bearings, has been announced by the Federal Products Corporation, Providence, R. I. The gage sorts the bearings into twelve classifications of 0.0001-inch differences. Unacceptable bearings are separated for scrap and salvage. Operating at a speed of 6000 to 8000 roller bearings per hour, the gage can quickly be adjusted to handle bearings with diameters and lengths ranging from 3/16 to 5/8 inch.

From a vibrating type hopper, the work-pieces are lined up end-to-end and dropped down a vertical feed chute to a platen. Here a reciprocating feeding finger pushes each work-piece into a slot in a rotating wheel which, in turn, carries them to the gaging stations. After the bearings are gaged electronically, they drop into the proper bins. 130



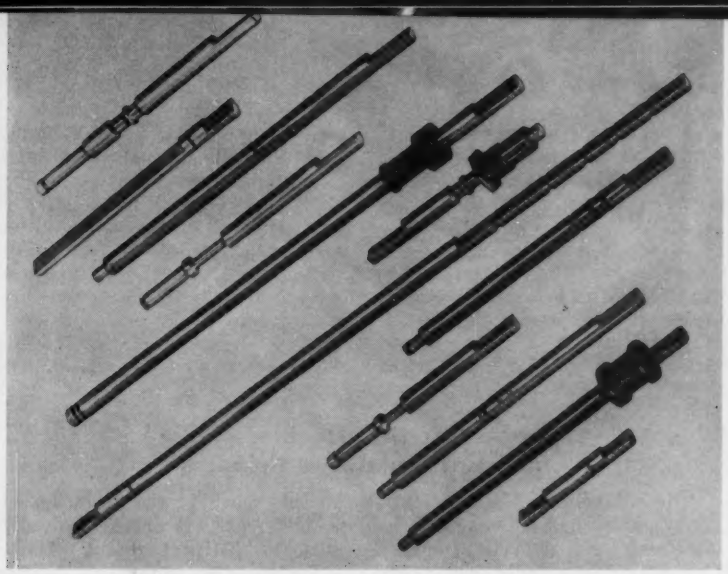
Mechanical multiple-spindle drilling machine of gearless head type built by Zagar Tool, Inc.

Zagar High-Speed Multiple-Spindle Drilling Machine

Zagar Tool, Inc., Cleveland, Ohio, has designed and built a high-speed mechanically actuated drilling machine having 529 spindles. All movements of this machine are obtained by mechanical means instead of the hydraulic systems used in previous Zagar drilling machines. The machine shown drills 3/16-inch holes. The 529-spindle drilling head is of the gearless type and permits holes to be drilled with their centers located only 1/4 inch apart. The drilling head is driven by a 30-H.P. motor. A mechanical motion similar to that of a shaper actuates the ram.

Material to be drilled is loaded manually into a hopper and mechanically positioned under the drilling head. Removal of the drilled part is accomplished by the succeeding part as it is fed mechanically to the drilling position. Adjustments for length of stroke, depth of hole, and drilling speed can be made to suit the job. . . 131

For more information on these products, use Inquiry Card, page 243



Some standard shafts being mass-produced by the Fox Products Co.

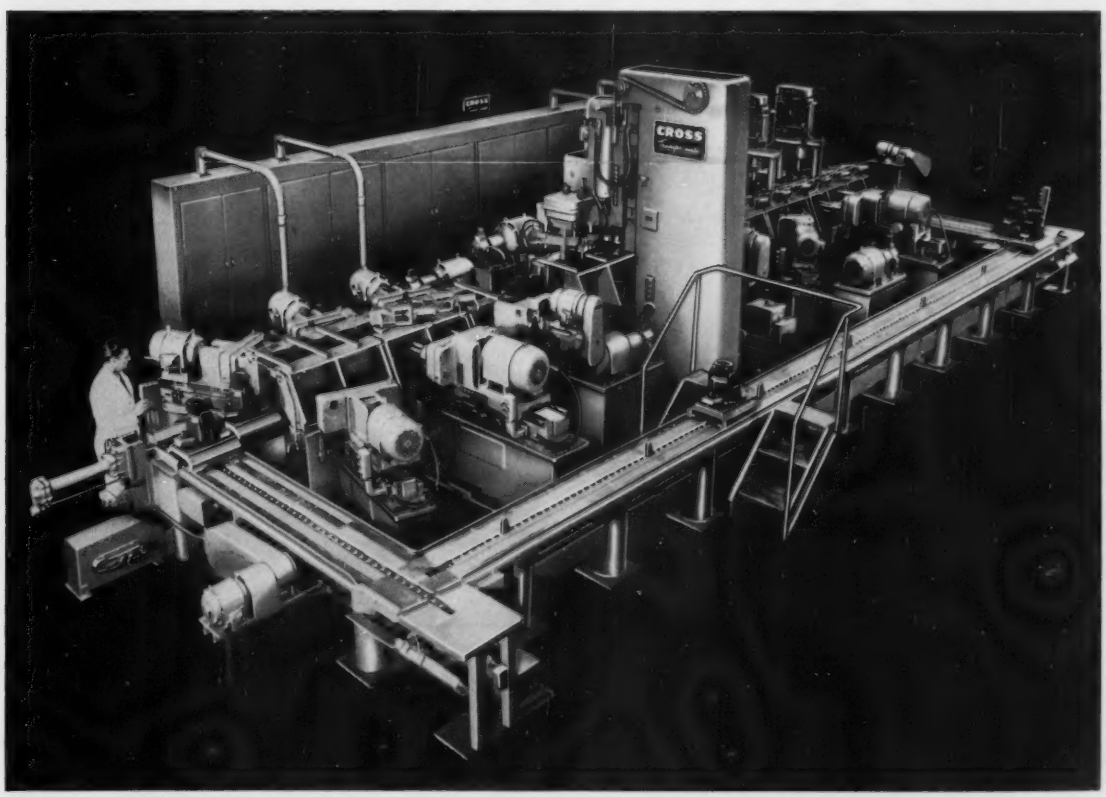
Standardized Special-Purpose Shafts and Sub-Assemblies

A large design range of standard shafts for use on electronic equipment, home appliances, and other applications is now being produced by the Fox Products Co., Philadelphia, Pa. The steel shafts, which are unplated, or cadmium or copper-plated, are now available in production quantities. Included are shafts with varied diameters, snap-ring grooves, single or double flats, knurling for pressed-on plastic or fiber bushings, and end-knurling for finger-tip actuation. Special control-shaft assemblies, with or without cams, can be supplied for chassis-mounting with flanged threaded bushings. . . 132

Cross Transfer-matic for Processing Transmission Cases

A special Transfer-matic machine for processing transmission cases has been built for a large automotive company by The Cross Company, Detroit, Mich. Features of this machine include automatic transfer of parts from station to station on pallet type work-holding fixtures and an integral conveyor which returns the fixtures from the unloading to the loading station. Provision is made for automatically stopping the machine if critical tools are broken or incorrectly set for depth of cut. Complete interchangeability of standard and special parts facilitates maintenance.

Other features include built-in chip conveyors, hydraulic feed and rapid traverse, an individual lead-screw feed for tapping, automatic lubrication, and construction to J.I.C. standards. The machine has twenty-one stations and performs a total of 107 operations, including drilling, chamfering, reaming, spot-facing, counterboring, boring, tapping, and inspecting. 133



Special Transfer-matic for processing automotive transmission cases built by The Cross Company



Self-centering bore gage marketed by George Scherr Co., Inc.

Scherr Self-Centering Bore Gages

A line of self-centering small-bore gages of the dial type has been brought out by the George Scherr Co., Inc., New York City. These gages are designed for checking bores for size, taper, and out-of-round and bell-mouth condition at any point. The instrument is centered automatically inside the bore by means of a spring-loaded bridge, the cradle-shaped ends of which form an equal-sided triangle with the feeler point.

To obtain various size ranges, gages from 0.240 inch upward are supplied with a set of interchangeable contact points which are screwed into the measuring unit at the end of the shaft. For measuring smaller holes, ranging from 0.200 to 0.240 inch, a fixed extension forming a bulge on the shaft is used in place of the cradle-shaped bridge opposite the main contact point. All measuring surfaces are made of hardened and ground cast steel. Tungsten-carbide tips are available. Seven gage sets are obtainable, ranging from 0.200 inch to 4 inches. 134

Gardner Vertical Double-Spindle and Horizontal Disc Grinders

The Gardner Machine Co., Beloit, Wis., has announced a redesigned No. 2V-18 vertical double-spindle grinder, Fig. 1, and a new 18-inch No. 188-18 horizontal disc grinder, Fig. 2. The vertical grinder is built to grind two parallel faces of small work-pieces simultaneously. It is designed for economical grinding of coil springs, carbon brushes, and small parts made from ceramic materials.

Work-pieces are loaded by hand into openings in a power-driven horizontally mounted rotary work-carrier. Speeds ranging from 1/8 to 1 R.P.M. are available for the work-carrier. The two Gardner "Wire-Lokt" abrasive discs used on this machine are 18 inches in diameter and are driven by totally enclosed 5-H.P. motors. These grinding discs have no center holes and thus permit work-pieces to pass directly across the center of the wheels. The newly designed hand-operated swinging arm wheel dresser may be seen at the right in Fig. 1. A wet grinding system can be furnished when desired.

The horizontal disc grinder, seen in Fig. 2, is for quick, free-hand grinding of a single flat surface on small parts. It is driven through multiple V-belts from a 5-H.P. motor mounted on a hinged plate for belt adjustment. There is an outlet in the base for attaching a dust collecting system. 135

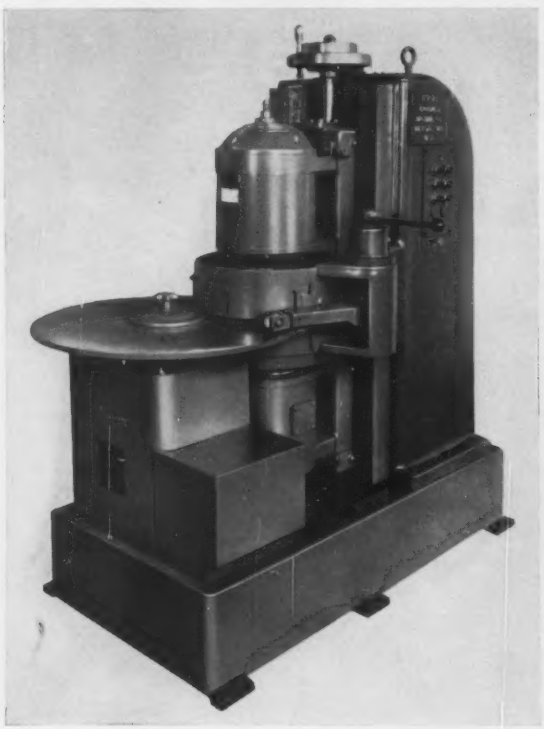


Fig. 1. Improved Gardner vertical double-spindle grinder

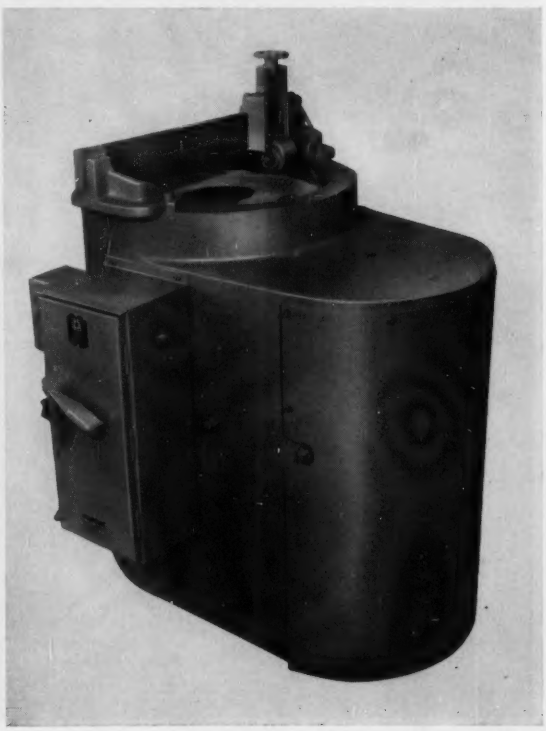
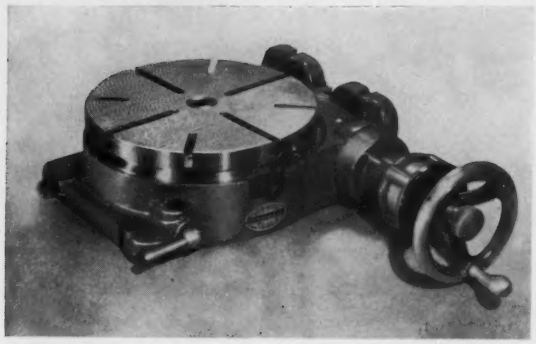
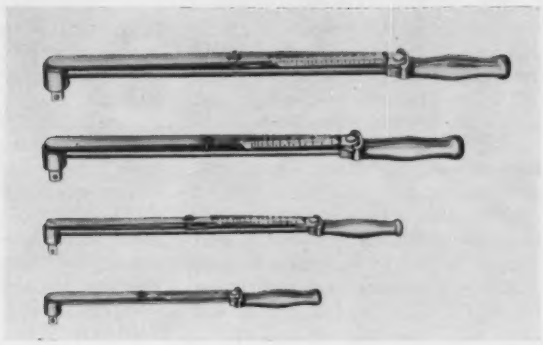


Fig. 2. New Gardner product—a horizontal disc grinder

For more information on these products, use Inquiry Card, page 243



Rotary table built by the Moore Special Tool Co., Inc.



Torque "Measurrenches" made by J. H. Williams & Co.

Moore Precision Rotary Table

A precision rotary table with a working surface 10 7/8 inches in diameter, which has an overall performance accuracy of plus or minus 6 seconds throughout 360-degree rotation, has been introduced by the Moore Special Tool Co., Inc., Bridgeport, Conn. The precise angular spacing of this table is achieved through the use of a thread-ground worm in combination with the accurately spaced teeth of its mating gear. The worm is kept in permanent engagement to prevent loss of accuracy resulting from repeated disengagements.

This rotary table is especially suited for spacing applications on jig borers and jig grinders. An additional vernier permits normal reading even in the vertical position. The steel table top runs parallel with the base within extremely close limits. Fine angular settings can be read to 5 seconds. The table can be used in conjunction with its companion unit, the new Model No. 2 sine plate, to produce compound angle settings. 136

Universal Table for Carlton Radial Drills

The Carlton Machine Tool Co., Cincinnati, Ohio, has announced that it now has available a universal table designed for use on its radial drills. This table has a 32-inch round top, and is mounted on anti-friction bearings for easy operation. It facilitates making fast set-ups for drilling compound angles. 137

Williams Torque Wrenches

A new series of torque "Measurrenches" for measuring right- and left-hand torque, employing a converging-scale method of torque reading, has been brought out by J. H. Williams & Co., Buffalo, N. Y. These wrenches are built to withstand hard abuse.

Machine-cut calibrations insure long life, accuracy, and easy reading. The wrenches are available in four capacity ranges in two drive sizes, from which it is possible to make a selection that will give the most accurate torque measurements in a range from 0 to 600 inch-pounds. 138

Kenco "Rigid Rib" Presses

The Kenco Mfg. Co., Los Angeles, Calif., has added two machines of 4- and 5-ton capaci-

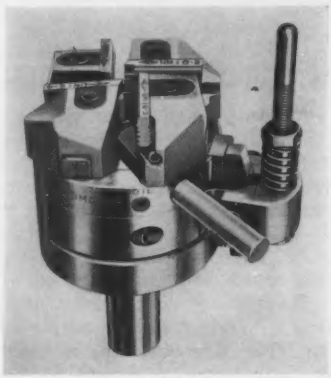


Universal table developed for Carlton radial drills



"Rigid Rib" bench press announced by the Kenco Mfg. Co.

ties to its line of power presses. The frames are made by the "Sobrocast" process and the crankshafts are made in one piece of alloy steel, heat-treated and precision-ground. The 5-ton press is a variable-speed type with speeds ranging from 90 to 285 strokes per minute. These "Rigid Rib" presses have a positive single trip as standard equipment and can be converted instantly to continuous operation by moving a lever. 139

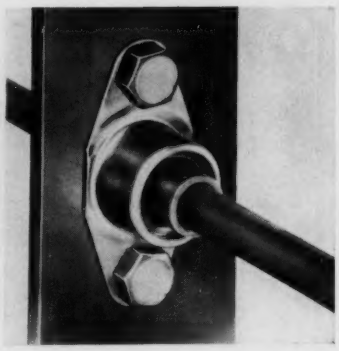


Landis tangential type self-opening die-head developed for Brown & Sharpe automatics

"Landmatic" Die-Head for Brown & Sharpe Automatics

The Landis Machine Co., Waynesboro, Pa., has recently developed the 1/2-inch capacity EXX Landmatic die-head for use with Nos. O, OG, 2, and 2G Brown & Sharpe automatic screw machines. Featured in the die-head are tangential chasers that cover a range from No. 4 to 1/2-inch diameter inclusive. Unlimited thread lengths may be cut on work-pieces under 3/8 inch in diameter, while a maximum of 1 13/16-inch thread length can be cut on larger work-pieces.

This external trip type die-head is designed with a floating shank having adjustable spring tension to provide a means of compensation for the lead of the feed-cam. Thus, the die-head is always able to start the threading operation with the proper amount of pressure for the thread pitch being produced. 140



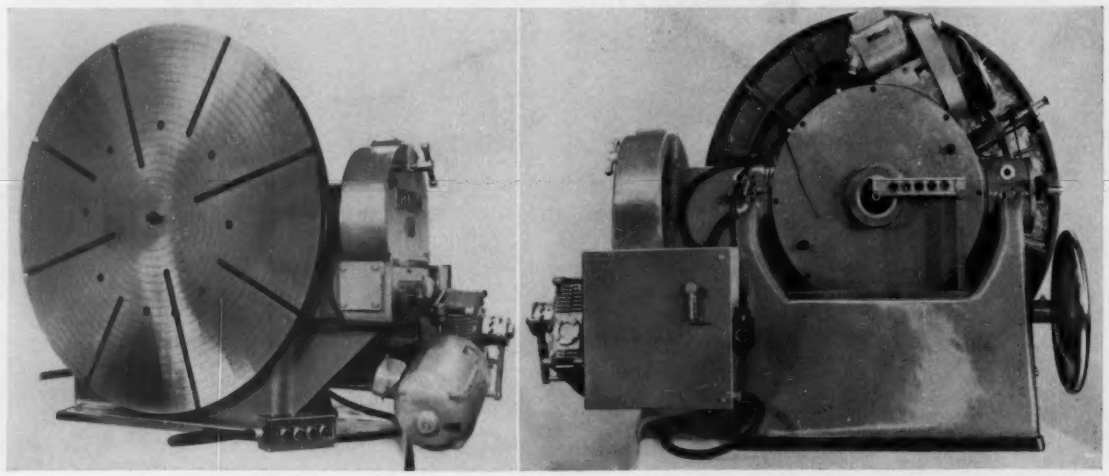
Precision radial bearing and flanged housing produced by the Nice Ball Bearing Co.

Flange-Mounted Radial Bearing

Nice Ball Bearing Co., Philadelphia, Pa., is now producing a new line of flange-mounted radial bearings. The assemblies, known as "6900" series, consist of a double, composition-sealed, precision radial bearing and a flanged housing, or adapter, designed for flush mounting. The housing provides a secure means of bolting the bearing in place while two set-screws position the bearing on the shaft. Series "6900" assemblies are recommended for medium loads with speeds up to approximately 5000 R.P.M., and are available in standard shaft sizes ranging from 1/4 to 1 inch in diameter. 141

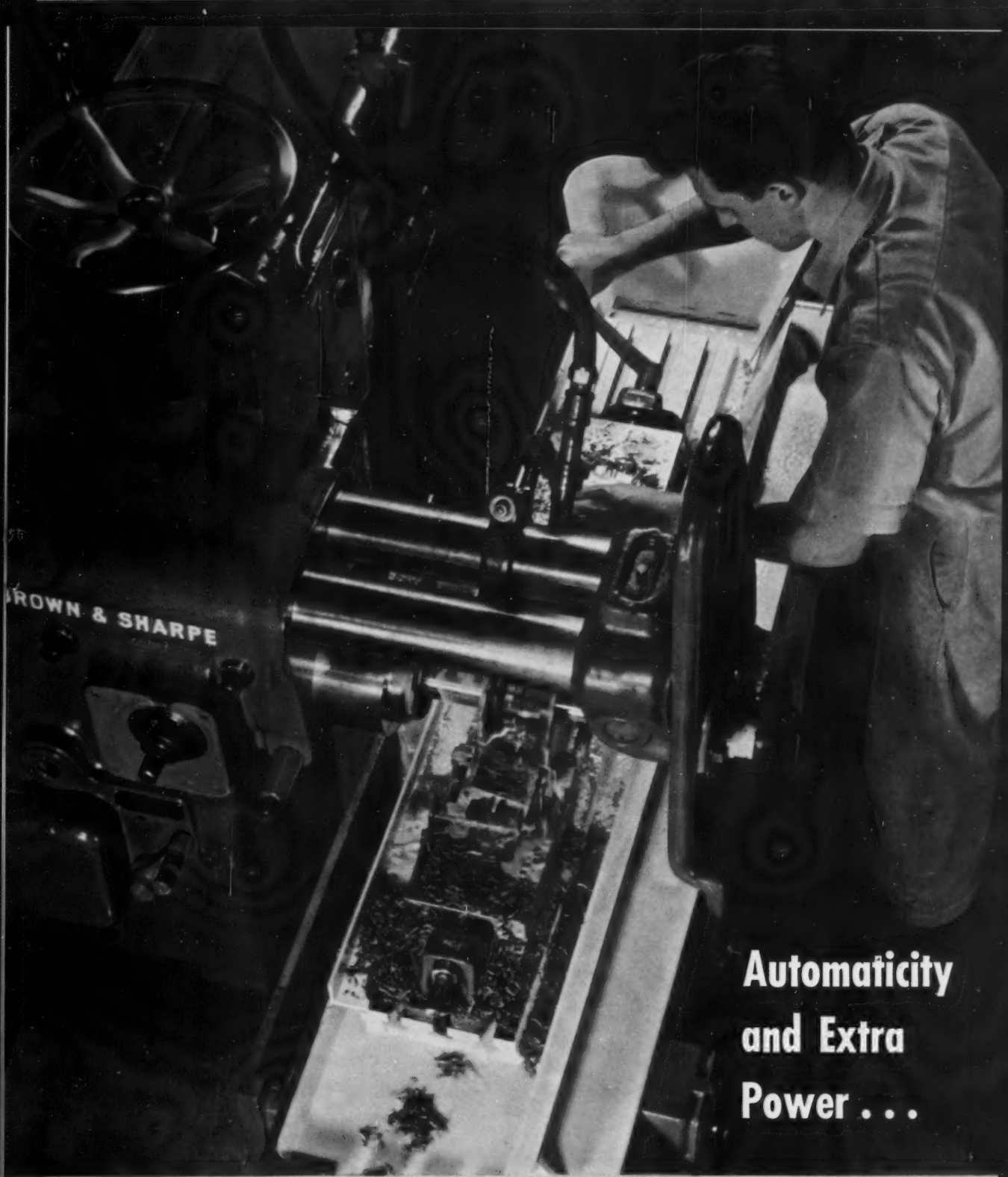
"Rotab" Universally Adjustable Rotating Table for Machining and Checking Operations

The Machine Products Corporation, Detroit, Mich., has announced several improvements in its "Rotab" rotating table. This device is calibrated for accurate movements in all planes to facilitate a wide range of machining and checking operations on radial and angular work. A new optical type micrometer microscope with glass vernier reticle permits direct reading to 5 seconds of an arc on a special graduated ring with clockwise and counter-clockwise markings from 0 to 360 degrees. The graduated ring, which is located directly under the rotating table and is rotated to the desired degree setting and clamped in position to become a fixed part of the table, is individually processed with utmost optical



Front and rear views of improved "Rotab" rotating table made by Machine Products Corporation

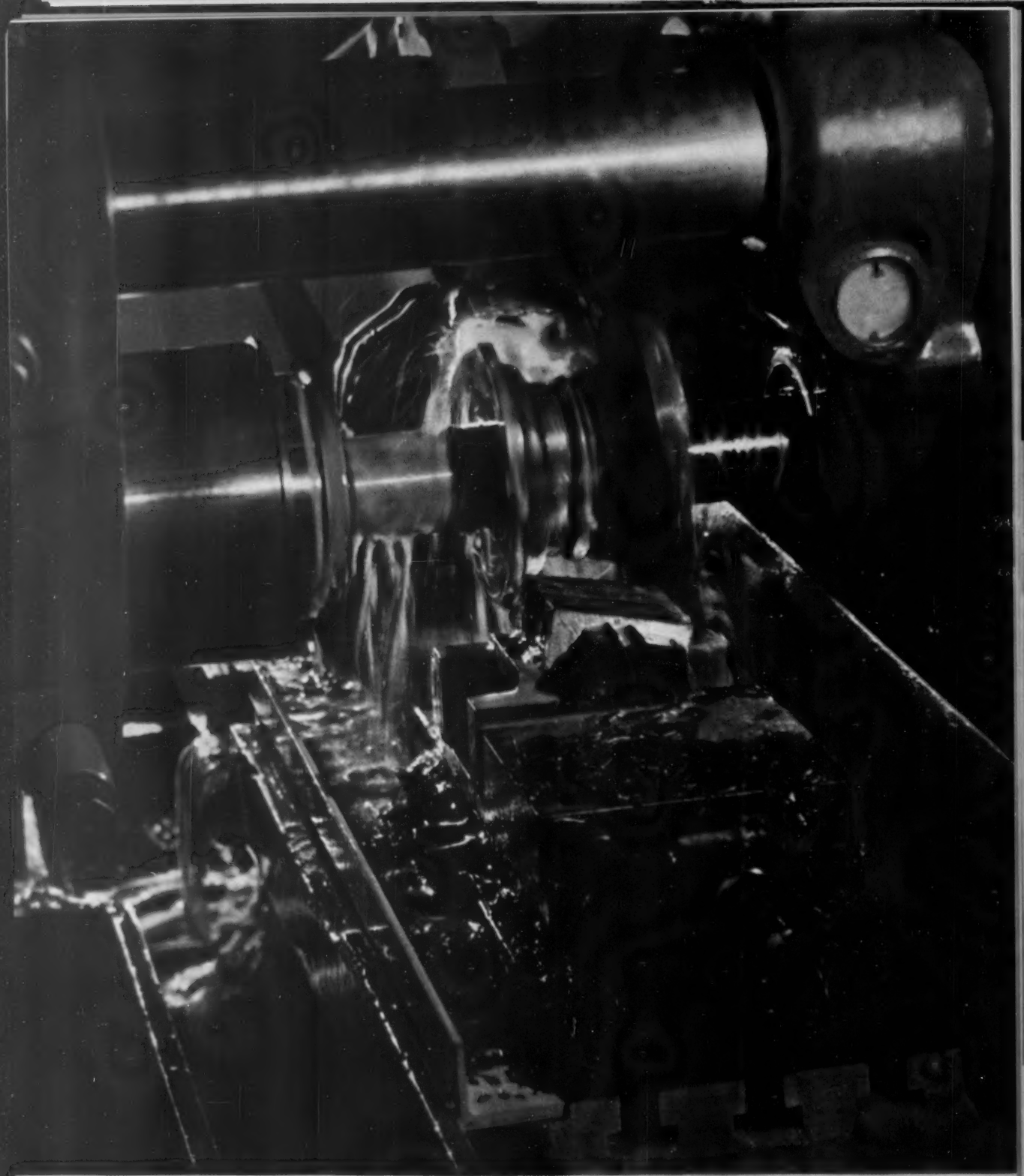
For more information on these products, use Inquiry Card, page 243



Automaticity and Extra Power . . .

Brown & Sharpe

. . . the 7½ H.P., electrically-controlled No. 12 Plain Milling Machine. You get full 7½ H.P. right at the spindle plus "push button" or automatic control of all power movements for rapid production on both long- and short-run jobs. Dual feed rates, a variety of automatic cycles, and the ability to climb mill in either direction are just a few of its other time-saving advantages. Write for complete details.



For top milling efficiency, buy long-wearing cutters from the Brown & Sharpe Complete Line . . . and always keep them "Cutting Sharp".

Buy through your local Distributor

Brown & Sharpe

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

Printed in U.S.A.

precision to avoid accumulative error in degree markings.

The center spindle, mounted on preloaded precision bearings, extends beyond the back plate. This provides a convenient point for the attachment of a sine bar for obtaining radial measurement from a shelf by gage-block setting when the faceplate is in a vertical position.

The "Rotab" is made with 12-, 24-, 36-, and 48-inch diameter faceplates, with motor drive for rotation on the larger sizes. Lubrication is provided by a one-shot system. 142

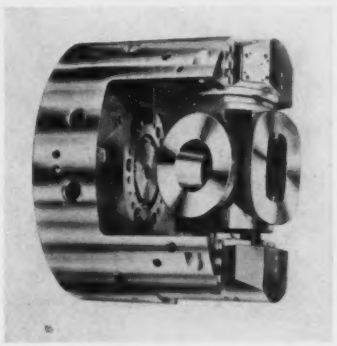
G & L "Air-Lift" Rotary Table for Machine Tools

A rotary table called the "Air-Lift," that can be revolved by the "flick of a finger," has been developed by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The table contains a collapsible type index-pin which eliminates all play or lost motion in the mechanism and compensates for any wear that might take place. The plunger can be firmly locked in the table and index block at the 90-degree positions to obtain positive indexing. Graduations provide for accurate positioning between the 90-degree intervals.

Turning an air valve at the base of the platen causes air to be forced into the unit, raising the table approximately 0.001 inch. With the air acting as a bearing, the table actually "floats on air," permitting off-center loads to be accurately indexed. After indexing the table, the air valve is closed and the table settles firmly on a plain non-lubricated seat. Only a light clamping action is required to secure the table. 143

Cushman Two-Jaw Indexing Chuck

Power- or scroll-operated two-jaw indexing chucks have been designed by the Cushman Chuck Co., Hartford, Conn., for holding work-pieces having opposing angular surfaces located in specific relation to one another. These chucks permit precision machining of all faces without the necessity of unloading and rechucking the work-piece. The chuck is especially useful in machining valve bodies.



Two-jaw indexing chuck placed on the market by Cushman Chuck Co.

Lever-actuated master jaws, mounted on two extending arms, move in and out in relation to the center of the chuck-face plane. Centered on these jaws are revolving jaws which rotate at right angles to the master jaw action. Formed jaws, which actually hold the work-piece, are fastened to the revolving jaws. On top of one master jaw is an indexing mechanism. This permits the operator to rotate the revolving jaw to the next machining position with a positive "click" indication. .. 144



Individual "electronic package" brought out by the Reliance Electric & Engineering Co.

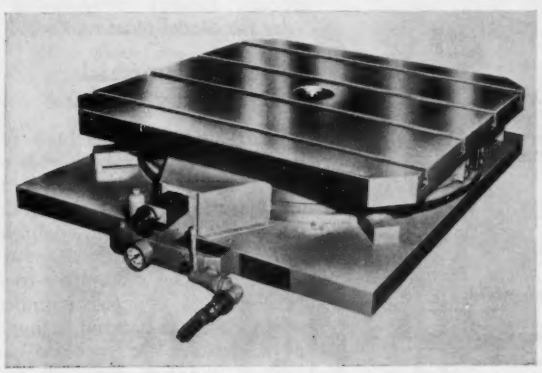
"Sealpak" Electronic Circuits

A new development in the design of electronic controls is the grouping of the various electronic circuits into separate units that are literally "electronic packages." This method is employed by the Reliance Electric & Engineering Co., Cleveland, Ohio, to give greater protection to electronic elements in the controls and to facilitate maintenance.

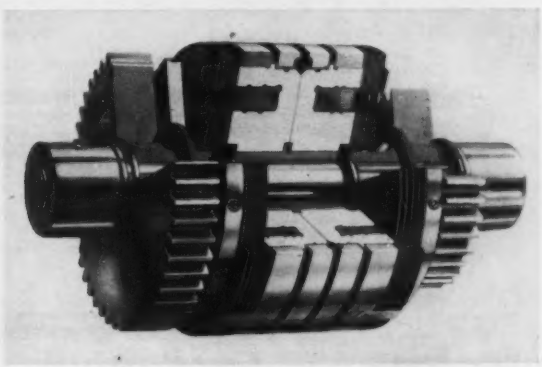
Each unit, which contains its own electronic circuit, is sealed in plastic and encased in a metal enclosure to provide protection against dirt, atmosphere, and shock. These packages are pretested and mounted on a panel independently and are interconnected by attaching leads to screw type terminals. When trouble occurs, its source is located and the faulty Sealpack replaced. 145

Electromagnetic Transmission Clutch

I-T-E Circuit Breaker Co., Philadelphia, Pa., has announced the availability of a newly designed electromagnetic clutch.



Giddings & Lewis "Air-Lift" rotary table that easily indexes heavy or off-center loads



Electromagnetic clutch manufactured by the I-T-E Circuit Breaker Co.

This "Electro Clutch," according to the company, meets the requirements of transmissions employing constant-mesh gearing. The clutch design provides constant output, quiet operation, and rapid speed change. The clutch is controlled by a 24-volt, direct-current circuit, and no field adjustment of the torque value need be made. Maintenance is at a minimum as the clutch is self-compensating. 146

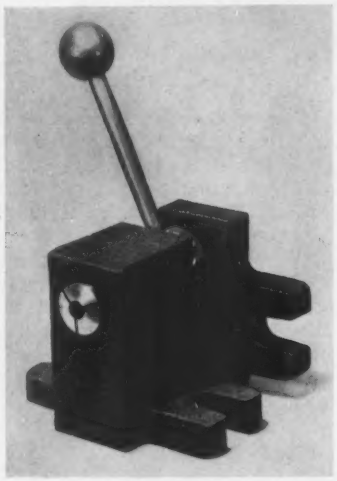


Fig. 1. Kenco collet-holding fixture

Kenco Two-Way Collet-Holding Fixture and a Toolmaker's Vise

The Kenco Tool & Die Co., Newark, N. J., is now manufacturing a two-way collet-holding fixture, Fig. 1, and a toolmaker's steel vise, Fig. 2. The fixture is intended for both tool-room and shop production work. It can easily be fitted with an ejection type stop and will hold round work up to 1/2 inch in diameter. Hexagon and square collets can be had.

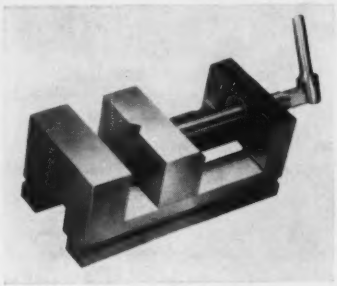


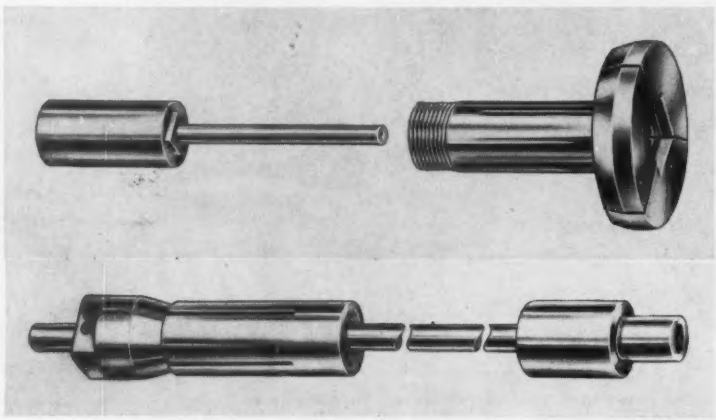
Fig. 2. Kenco toolmaker's vise

The toolmaker's vise has a V-slot in the movable jaw for clamping round work. Two milled slots in the base facilitate clamping to the machine table. The vise is 1 3/4 inches high, 2 inches deep, and 4 1/8 inches long. . . 147

Collet Stop and Ejector

A collet stop and a collet ejector have been brought out by B. L. Knapp Industries, Syracuse, N.Y. The collet stop, shown at the top, is designed for all manual and automatic lathes regardless of size. Tightening an expander bolt spreads a split sleeve, locking the unit within the lathe draw tube. A set-screw located in the expander bolt may be loosened for adjustment purposes.

The unit shown at the bottom is a collet ejector. All moving parts are completely enclosed. The ejector plunger, which is spring-actuated, pushes the work-piece upon release of the collet. . . . 148



(Above) Knapp universal collet stop, and (below) collet ejector



Four-fluted reamer with left-hand spiral, a Chicago-Latrobe product

Chicago-Latrobe Bridge Reamers

A reamer designed for use in the field to enlarge and align holes in structural members such as I-beams, channels, and plates has been brought out by Chicago-Latrobe, Chicago, Ill. This four-fluted reamer promotes a free-cutting action and provides more chip space than the conventional five-fluted type. The left-hand spiral prevents grabbing or hogging-in, with subsequent stalling when used with an air tool. The reamer is available in sizes ranging from 13/32 inch to 1 1/2 inches in diameter. The tool is provided with a pilot to facilitate entry into small or irregular holes. 149

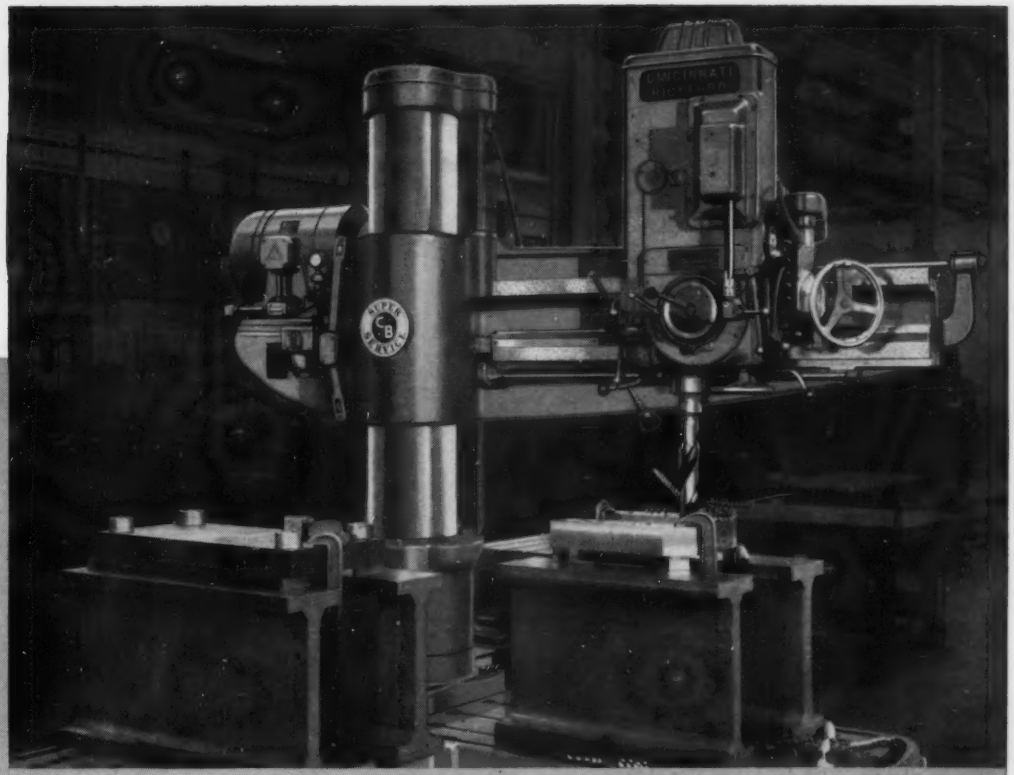


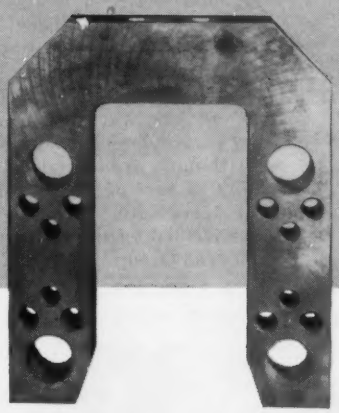
Deburring machine with double, opposed spindles manufactured by the Model Machine Co.

Semi-Automatic Deburring Machine

A semi-automatic machine for removing burrs from both ends of through holes simultaneously is being manufactured by the Model Machine Co., Inc., Philadelphia, Pa. The machine uses standard countersink type deburring tools in the double opposed spindles. The spindles are rotated in opposite directions to provide an equalized cutting action. Both ends of holes through small parts, including pieces of irregular shape as well as short lengths of tubing

For more information on these products, use Inquiry Card, page 243





50% SAVED

IN DRILLING OPERATIONS ON

PROGRESSIVE DIES, TOOLS, JIGS, FIXTURES

The piece shown is an anvil on horn tube Pierce die.

Photos courtesy Koppy Tool & Die Company, Ferndale, Michigan

The capacity and performance of this Cincinnati Bickford Super Service Radial has effected real savings in the shop at Koppy Tool & Die Company. On the operation shown a 50% saving was effected with the installation of this new Bickford Super Service Radial. eighteen holes are being drilled from 1 27/64″ to 3″.

Write for Catalog R 29 on Super Service Radials—there's a size for your needs.

CINCINNATI BICKFORD

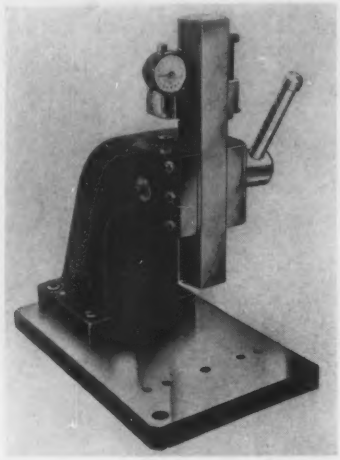
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

or flat pieces, can be deburred at the rate of 600 to 3000 holes per hour.

Work-holding fixtures are not required. The operator simply inserts a part, and depresses the control pedal. The machine automatically deburrs the work, leaving the operator's hands free. Spindle speeds range from 150 to 550 R.P.M. The machine has a capacity of 6 inches between chucks, a swing of 6 inches, and is recommended for deburring up to 1-inch diameter holes. 150



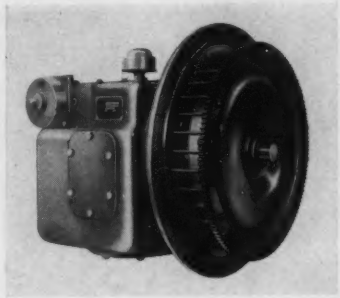
Micro press introduced by Queens Tool Engineering & Mfg. Co.

Micro Press for Small Precision Work

A small press for assembling, piercing, broaching, forming, and burnishing operations that require accurate line-up and controlled depth has been introduced by the Queens Tool Engineering & Mfg. Co., Rockville Centre, N. Y. The press has a maximum force of 880 pounds, a leverage ratio of 22 to 1, and a maximum ram-to-base distance of 7 inches. Its work area measures 8 3/4 by 7 3/4 inches and the base, 9 by 14 inches. A two-piece stop mechanism has a fine-thread adjusting screw incorporated in the dial indicator. 151

Compound Planetary Type Transmission

A compound double-planetary type transmission of 150 pound-feet input torque, for use with a torque converter having a 2.12 multiplying factor, has been placed on the market by the American Gear & Mfg. Co., Lemont, Ill., subsidiary of the Brad Foote Gear Works, Inc., Cicero, Ill. Designed for fork-lift trucks, hoists, cranes, machine tools, and other applications, the PGT-150 "Plan-Gear" transmission can be shifted from full-speed forward to full-speed reverse in only one and one-half seconds.

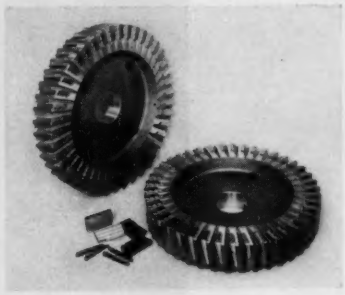


Compound planetary transmission, for use with torque converter

Control of the transmission is obtained by movement of a single hydraulic valve lever. Because all gears of the two planetary systems are always in mesh, no damage to the transmission can result from careless manipulation of the control lever. Power take-off apertures are provided on both sides of the transmission. 152

High-Feed Milling Cutter for Cast Iron

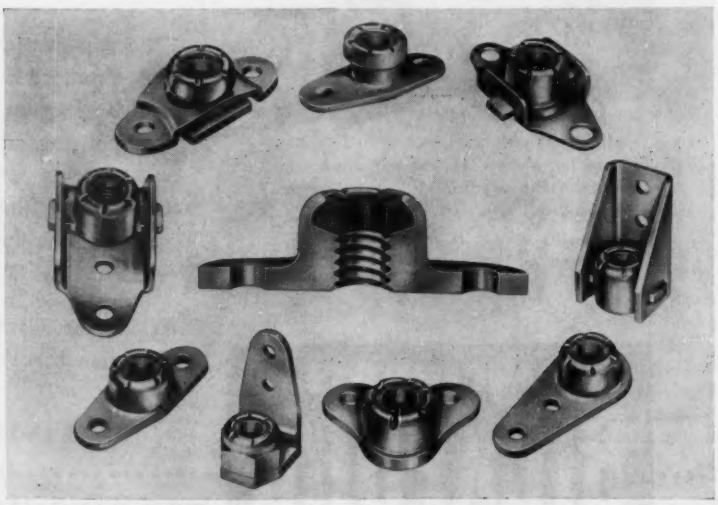
Inserted-blade milling cutters capable of feeds in excess of 100 inches per minute, and employing more than four blades per inch of diameter, have been announced by the Wesson Co., Detroit, Mich. Designed for maintaining a high feed rate during the machining of cast iron, the new 7200 Series cutter consists of a hardened steel body with broached blade slots, carbide-tipped blades, and hardened steel wedges. It is available in diameters ranging from 6 to 20 inches. 153



Wesson milling cutters for maintaining high feed rates

Elastic Stop Nuts with Nylon Inserts

The re-usability, chemical inertness, and other advantages of nylon inserts have been made available in the line of anchor and gang channel nuts manufactured by the Elastic Stop Nut Corporation of America, Union, N. J. These nuts, also called fixed nuts or plate nuts, are intended for assembly as part of an airframe or other structure. They qualify under AN366 by the Aeronautical Standards Group. 154



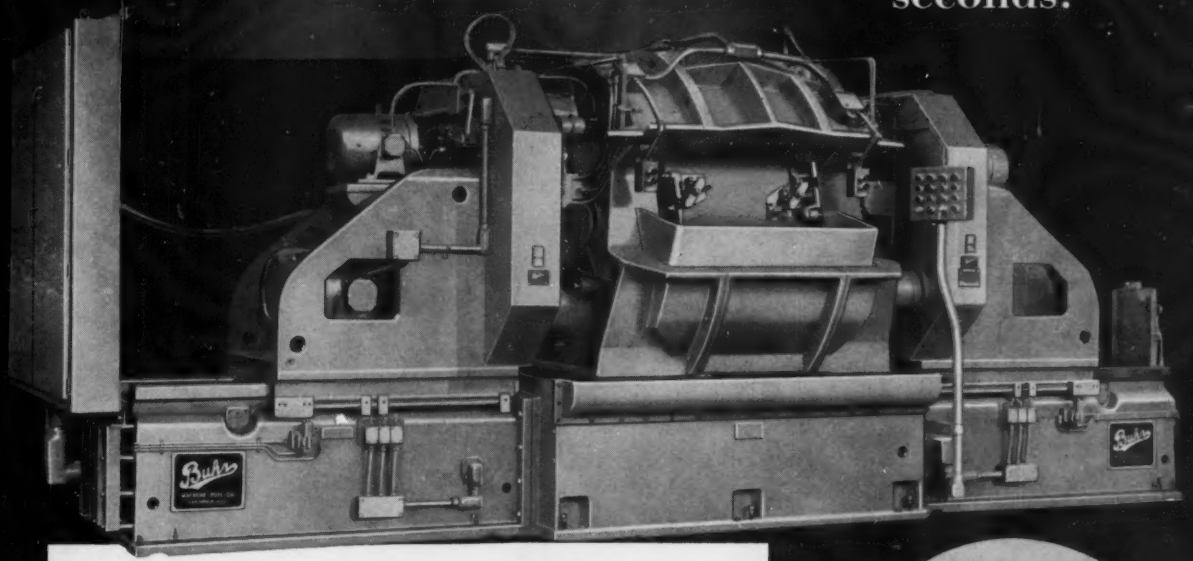
Elastic stop nuts with nylon inserts designed for assembly as fixed parts

For more information on these products, use Inquiry Card, page 243

Buhr

SPECIAL...

Drills, chamfers and taps two rear axle drive shafts every 22 seconds!



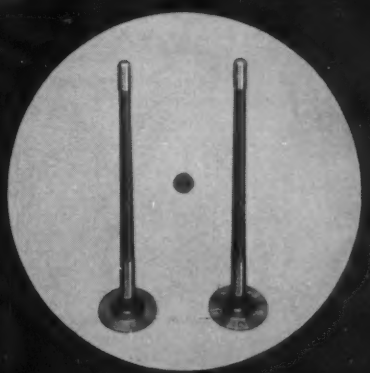
This Trunnion-Type Buhr Special drills, chamfers (both sides of holes) and taps 328 pieces an hour at 100% efficiency.

Two parts are loaded per fixture on this 6-station, 2-way Buhr Special.

Hydraulic clamping-and-unclamping is completely automatic.

Cluster heads — incorporated in a master gear box — are featured, as with all Buhr Trunnion-Type Machines.

On Buhr Specials, all parts are held to tolerances and are completely interchangeable. All component assemblies are located by precision-bored dowels. These Standard Buhr Features assure precision alignment!



See the complete range of Buhr Specials. Send for catalog or let one of our sales executives call on you.

BUHR MACHINE TOOL CO.

252 GREEN STREET, ANN ARBOR, MICHIGAN

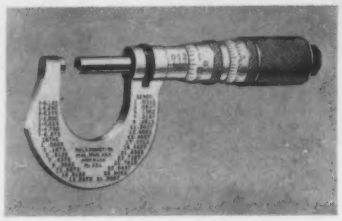
Solidly Engineered . . . Precision Built for World's Leading Manufacturers

Buhr

MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY

Starrett Direct-Reading Micrometer Caliper

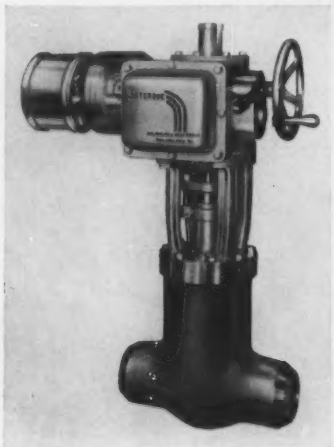
A micrometer caliper which reads direct to 0.0001 inch without a vernier is announced by L. S. Starrett Co., Athol, Mass. The micrometer has an inner thimble reading to 0.001 inch and an outer thimble reading to 0.0001 inch. In use, the measuring faces are brought up snug to the workpiece, and are then "loaded" by

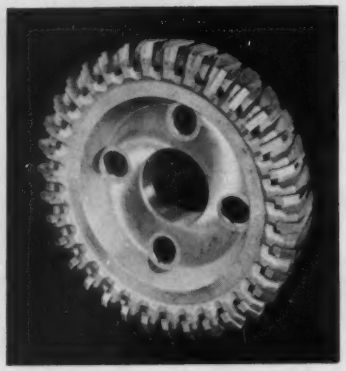


continued rotation of the outer thimble through approximately ten divisions. The outer thimble is permitted to return under spring tension until a 0.001-inch graduation on the inner thimble lines up with the reading line on the sleeve. The 0.0001-inch reading is taken directly from the outer sleeve. Accuracy throughout the range of the instrument is within 0.00005 inch. 155

LimiTorque Valve Control

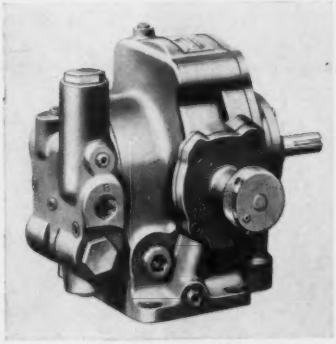
Valve equipped with LimiTorque control brought out by the Philadelphia Gear Works, Inc., Philadelphia, Pa. This control is designed to eliminate the need for manual operation of valves. Simplicity, economy, and dependability are advantages claimed for this control when fully automatic operation is desired. 156





"Shear Clear" Fast-Cutting Face Mill

A new face mill has been added to the line of "Shear Clear" cutters manufactured by the Ingersoll Milling Machine Co., Rockford, Ill. A feed rate in excess of 100 inches per minute is being realized during rough-milling of the main surfaces of automobile engine blocks and heads. This cutter achieves its high feed rate by means of improved blade angles on the carbide-tipped inserts, resulting in a free-cutting, shearing action. The cutter is manufactured in sizes from 2 1/2 inches in diameter up. 157

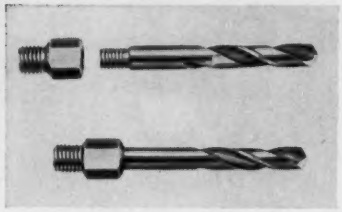


Variable-Delivery Pump

One of a new line of one- and two-way variable-delivery pumps for variable-speed, straight-line and rotary drive applications requiring 1 to 3 H.P. under precise speed or pressure control announced by the Oilgear Co., Milwaukee, Wis. Each pump is furnished as a complete package unit with a wide choice of standard controls and valve equipment. These pumps can be mounted on reservoirs integral with machines or furnished with standard reservoirs for mounting the pump and driving motor. 158

Drills for Use with Flexible Drive-Shafts

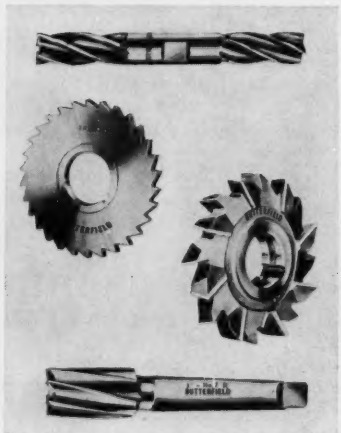
Improved drill (lower view) for use with flexible drive-shafts or extension arms offered by the National Twist Drill & Tool Co., Rochester, Mich. This new drill is adapted for drilling holes in inaccessible and narrow places, such as found in airframe fuselages, wing and tail surfaces, and other complex sheet-metal assemblies. The older type drill (upper view) required an adapter with a threaded shank drill. The im-



proved drill has the two members combined in one unit. This results in a drill of shorter length that is more adequately suited for use in close quarters and which can be used for a wide range of work. 159

Butterfield Milling Cutters and End-Mills

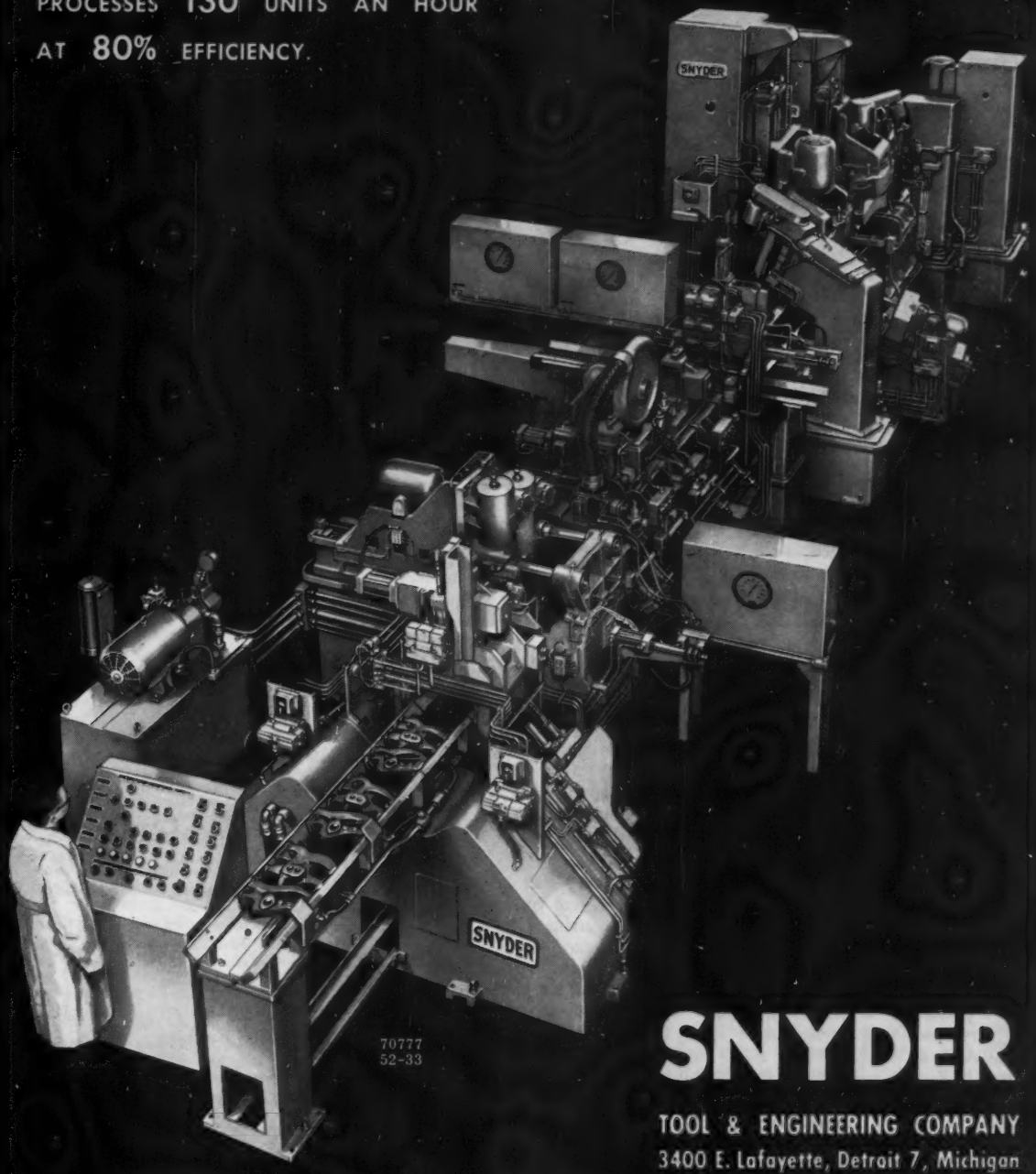
Butterfield Division of Union Twist Drill Co., Derby Line, Vt., has announced the addition of milling cutters and end-mills to its line of cutting tools, which has long included taps, dies, reamers, and screw plates. Now drills, high-speed counterbores, and spot-facing tools with interchangeable pilots have been added to the products of this company. 160



For more information on these products, use Inquiry Card, page 243

SNYDER SPECIAL 21-STATION AUTOMATIC LINE

TRANSFER MILLS, DRILLS, CORE-DRILLS, REAMS AND TAPS INTAKE MANIFOLDS; TESTS MANIFOLD FOR AIR LEAKAGE AND VOLUMETRIC AIR FLOW, INSPECTS PROCESSING PROGRESSIVELY, MARKS REJECTS; INSERTS HEATER TUBES; PROCESSES 130 UNITS AN HOUR AT 80% EFFICIENCY.



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TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation with Leading American Industries

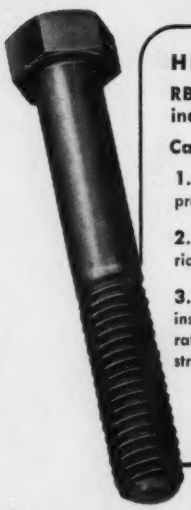


Sure, you'd need special cap screws here!

Some people have strange ideas on tightening cap screws.

Like the manufacturer we ran across recently. His workmen tightened cap screws far beyond their load limit as a matter of course. Naturally, this caused costly screw failures in the field. Also naturally, the boss figured the only way out was to buy expensive special screws with higher physical properties. Just in time, a sharp-eyed RB&W "fastener engineer" pointed out that a high-quality standard RB&W cap screw could do the same job — if the tightening method was corrected.

This incident spells out a cost-saving story for every user of fasteners. Maybe there's a stage in your operation where you're using a fastener designed for a bigger job than you're giving it. So it's important for you to know that an RB&W *standard* screw, nut or bolt can often give you the same dependable service you're paying extra for now. The facts in the box at right make it well worth a phone call to the nearest RB&W office to find out how these very special standards can do a job for you. RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N.Y. 4.4



HERE'S WHY...

RB&W standards often surpass industry standards.

Cap screws, for example:

1. They're cold-headed — the process that produces the best bolts and cap screws.

2. Cold-heading requires superior materials — resulting in sounder products.

3. Modern equipment and quality control insures precise sizes, superior finish, accurate threading — for fast assembly and stronger end products.

4. RB&W cold-heads the widest size range in industry.

RB&W **RUSSELL, BURDSALL & WARD**

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For more information on products advertised, use Inquiry Card, page 243

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

TURNING MACHINES—Monarch Machine Tool Co., Sidney, Ohio. Manual entitled "Speeds and Feeds for Better Turning Results," consisting of a guide—prepared for engineers, methods departments, and lathe operators—for establishing proper cutting speeds and feeds. Technical metal-turning data have been included. Information is given on all types of ferrous and non-ferrous alloys, based primarily on dynamometer tests made on Monarch lathes. A limited quantity of this manual is available; it can be obtained by request on a company letterhead direct to the above concern.

INSTRUMENT GEARS—Micron Gear Mfg. Co., Dept. P, 102-38 Corona Ave., Corona 68, N. Y. Catalogue illustrating the kind of work this company performs in the field of precision instrument gears. Micron gears are incorporated in aviation instruments, adding machines and calculators, computing machines, electronic instruments, servomechanisms, and many other devices. Can be obtained by company letterhead request direct to the above address.

ROTARY TABLE—Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn. Form RT2, describing the company's new 11-inch rotary table for precise angular spacing, which is achieved by use of a non-disengageable, thread-ground worm in combination with the accurately spaced teeth of its mating gear. This booklet can be obtained by writing on a company letterhead direct to the above address.

MACHINE, ELECTRICAL, AND RESEARCH FACILITIES—Kell-Strom Tool Co., Inc., Wethersfield, Conn. Folder 754, describing the work of the company's three divisions: The Machine Division has facilities for large-diameter turning, gear shaping, thread grinding, jig boring, cylindrical or internal grinding, and milling; the Electrical Division specializes in electrical, electronic, and sheet-metal engineering and production; and the Engineering and Research Division designs, develops, and engineers practical solutions to difficult mechanical and electrical problems, as well as fabricating prototype units. 1

BEARING ALLOYS—Mueller Brass Co., Port Huron, Mich. 21-page catalogue, comprising an engineering handbook describing the "600" series bearing alloys, a group of lightweight, high-strength, copper-zinc base alloys developed by the company. The alloys are said to have excellent bearing and mechanical properties, good non-galling and non-seizing characteristics, and high resistance to corrosion. Typical applications of the alloys are shown, and the research and control facilities at Mueller Brass are also illustrated. 2

DIAMOND GRINDING WHEELS AND HONES—Norton Co., Worcester, Mass. Catalogue 1233, 52 pages containing a comprehensive assortment of standard sizes of diamond grinding wheels and hones, with their net prices in various ordering quantities. The booklet also includes information on diamond wheel markings, selection of wheels, standard shapes of wheels, and suggestions on the use of diamond wheels and hones. 3

FOLDERS AND BRAKES—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 74-B, presenting the company's new air-actuated adjustable bar folder used for bending or folding sheet metal to an angle or lock. The machine is suited to any shop where air is available at pressures from 70 to 80 pounds per square inch. Also described are hand- and foot-operated folders and brakes, with examples of sheet-metal work produced. . . 4

LINK-BELT PRODUCTS—Link-Belt Co., Chicago, Ill. Catalogue 950, containing 340 pages descriptive of the company's standard products. These include chains and sprockets for driving conveyors and elevators, and for other forms of power transmission; enclosed gear drives; bearings and couplings; processing equipment; conveyors; and auxiliary products. Capacity charts and dimension tables aid in the selection of standard products and stock items for new installations. 5

FIRE HAZARDS IN METAL-WORKING—National Board of Fire Underwriters, New York City. 57-page survey entitled "Fire Hazards and Safeguards for Metal-working Industries." Since 1942, according to the National Board of Fire Underwriters, there have been about 175 large-loss fires in the metal-working industries. This survey stresses fire prevention and protection of plant construction, process lay-out, and operations. 6

ZIRCONIUM—Carborundum Metals Co., Inc., Akron, N. Y. Booklet entitled "Facts About Zirconium," containing 64 pages of information about the history and production of zirconium—mechanical and physical properties; chemical properties; and data on the fabrication of zirconium, such as melting, forging, welding, and machinability. A bibliography is included. 7

GRINDING WHEELS—Norton Co., Worcester, Mass. Catalogue 1052, consisting of 28 pages in which Norton grinding wheels carried in stock are described, together with a supplement of net prices. The subject of grinding wheel selection is covered in considerable detail—abrasive types, bonding materials, wheel speeds, wheel markings, standard wheel shapes, mounted points, and abrasive polishing grain. 8

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AIR GAGES—Sheffield Corporation, Dayton, Ohio. 30-page catalogue on Precisionaire air gages, tooling, and accessories, together with a price list. Included are the full line of column type Precisionaires, their amplifications and scales, and complete lists of standard sizes and types of air spindles, air snaps, other types of gaging units, and master setting discs and rings. 9

AUTOMATIC FORMING AND THREADING MACHINES—Landis Machine Co., Waynesboro, Pa. Bulletin E-70-6, 15 pages giving detailed data and specifications of Landis automatic forming and threading machines. The 3/4-inch machine features a bolt diameter range from 1/4 to 3/4 inch, while the 1-inch machine covers a range from 1/2 to 1 inch. 10

GRINDING WHEEL DRESSERS—Desmond-Stephan Mfg. Co., Urbana, Ohio. 24-page catalogue covering Desmond grinding wheel dressers and cutters. Three types of dressers—mechanical (revolving metal cutters), abrasive wheel or stick, and diamond—are considered, and the grinding operation for which these dressers are best suited analyzed. 11

DUCTILE IRON—International Nickel Co., Inc., New York City. Bulletin DI-16, entitled "Effect of Chemistry and Section Size on Properties of Ductile Iron," a paper presenting the results of an investigation on the influence of carbon, silicon, and phosphorous contents and of section size on the mechanical properties of ductile iron. 12

BLAST-CLEANING BARRELS—Pangborn Corporation, Hagerstown, Md. Bulletin 226, describing the various models of "Continuous-Flo" Rotoblast barrels available for production line blast-cleaning. Two major advantages are pointed out—the elimination of time lost in loading and unloading; and the elimination of manual handling. 13

DIE-MAKING FACILITIES—National Die Casting Co., Chicago, Ill. Booklet describing and illustrating the company's quality-controlled zinc and aluminum die-casting service. Included are two charts—one on the composition of zinc and aluminum alloys for die-casting; and the other, a specific gravity chart. 14

PORTABLE HARDNESS TESTER—Barber-Colman Co., Rockford, Ill. Leaflet F 1689-2, presenting data on the Barcol Impressor, a portable hardness tester for aluminum, aluminum alloys, copper, brass, and other materials, including plastics. The ease with which the instrument can be used is explained 15

EXTRUDED SHAPES—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Bulletin describing the hot extruded shapes the company can now supply in stainless and tool steels, high-temperature alloys, and other steels. Illustrations of shapes already produced by the company's new hot extrusion department are also included. 16

BLAST-CLEANING MACHINE—Pangborn Corporation, Hagerstown, Md. Bulletin 225, descriptive of the Blastmaster Rotoblast, showing how production savings may be realized by using this machine, which is designed specifically for batch blast-cleaning of castings, forgings, and heat-treated parts. 17

HYDRAULIC POWER UNIT—Logansport Machine Co., Inc., Logansport, Ind. Catalogue 200, Section 1, containing engineering data on changes in the company's hydraulic power unit Model 6031, which now provides pressures from 1200 to 2000 pounds per square inch. The previous model provided pressures from 250 to 1000 pounds per square inch. 18

CABINET LATHE—Rivett Lathe & Grinder, Inc., Boston, Mass. Bulletin 918-SLB, entitled "Machining for Profit," featuring the Rivett 918 "Steelway" cabinet lathe, and showing how the tool-room precision of the lathe operates on production jobs. Attachments and accessories are concisely described. 19

MACHINE TOOL ATTACHMENTS AND ACCESSORIES—South Bend Lathe Works, South Bend, Ind. Catalogue 5418, containing 39 pages of specific information on attachments and accessories for South Bend precision tool-room and engine lathes, turret lathes, drill presses, a bench shaper, and pedestal grinders. 20

GEARS AND REDUCERS—Cone-Drive Gears Division of Michigan Tool Co., Detroit, Mich. Bulletin 789-54 entitled "Standardized 7 Ways to Cut Your Power Transmission Costs," featuring Cone-Drive reducers, gear sets, and components. Typical horsepower ratings at 100 and 1750 R.P.M. of the pinion are given in condensed chart form. 21

STAINLESS-STEEL ELECTRODES—Crucible Steel Company of America, Pittsburgh, Pa. 16-page data sheet entitled "Rezistal (R) Stainless-Steel Electrodes," a reference booklet to assist in the selection of the proper grades of welding rod for a given grade of stainless steel. There is a section on welding procedure. 22

COLD-FORMING MACHINES—Michigan Tool Co., Detroit, Mich. Bulletin RF-54, describing the Roto-Flo "chipless machining" process of cold-forming splines, serrations, and other similar external shapes. Covered are the tooling, parts formed, automation of the cold-forming machines, and a typical application. ..23

AUTOMATIC TURRET LATHES—Potter & Johnston Co., Pawtucket, R. I. Bulletin 154, entitled "34 Practical Production Ideas to Help You Increase Output and Reduce Costs," consisting of 23 pages of case histories featuring Potter & Johnston automatics engineered for high-production tooling. 24

AUTOMATIC MULTIPLE-SPINDLE MACHINES—Bodine Corporation, Bridgeport, Conn. Catalogue illustrating the "40-10" automatic dial-feed, multiple-spindle machine. Design features, manufactured parts, and case histories, as well as operating instructions and maintenance information, are covered. 25

PULL-DOWN BROACHING MACHINES—Colonial Broach Co., Detroit, Mich. Bulletin RD-54, descriptive of nine models of pull-down broaching machines particularly suited for internal broaching where high surface finishing is desired. Design details and features are summarized. 26

VARIABLE-DELIVERY PUMPS—Oilgear Co., Milwaukee, Wis. Bulletin 47010, featuring the company's new line of Type "A" packaged variable-delivery pumps for either straight-line or rotary drive ap-

Product Information Service

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157	158	159	160	161	162	163	164	165	166	167	168	169	170

For more details on products mentioned in October editorial or advertising pages, fill in below:

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TITLE .....

COMPANY .....

CO. ADDRESS .....

CITY ..... **ZONE** ..... **STATE** .....

This card is void after January 1, 1955 **M-10/54**

plications. Diagrams and dimensions of various pump models are shown. Typical pump circuits are also featured. 27

ELECTRIC DRIVES AND CONTROLS—Reliance Electric & Engineering Co., Cleveland, Ohio. 12-page booklet entitled "The Tools of Automation," showing how Reliance motors, V-S drives, controls, and electronic regulators can be applied in industrial plants, to automatic movements and work processes. 28

IRON CASTINGS—International Nickel Co., Inc., New York City. 36-page glossary of terms for producers and users of iron castings. Over 150 technical terms that are used in common between suppliers and users of ferrous and non-ferrous castings are defined. 29

DESIGNATIONS FOR WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS—Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. Wall chart showing the new designation system for wrought aluminum and wrought aluminum alloys, and giving the old designations for comparison. 30

FACILITIES FOR CUTTING GEARS, SHAFTS AND OTHER PARTS—Penn Machine Co., Johnstown, Pa. 24-page catalogue illustrating the types of parts the company is equipped to produce—gears, sprockets, shafts, bronze castings, and specially designed pieces. 31

HIGH-SPEED DRILLS—Chicago-Latrobe Twist Drill Works, Chicago, Ill. Catalogue describing high-speed utility drills designed and heat-treated for tough, portable body and sheet-metal drilling jobs requiring a sturdy, short drill. 32

LIVE BUSHINGS—J. G. Jergens Division of Donley Products, Inc., Cleveland, Ohio. Catalogue giving engineering data on Jergens live roller bearing bushings, and illustrating applications on a boring mill, a radial drill press, and a milling machine. 33

STAINLESS STEEL—Firth Sterling, Inc., Pittsburgh, Pa. Catalogue Section 25-150 on Type 420 stainless steel, commonly known as the cutlery type, which is also useful for other purposes where a combination of good resistance to corrosion and wear is a factor. 34

PRECISION CAMS—Ford Instrument Co., Division of the Sperry Corporation, Long Island City, N. Y. Bulletin describing and illustrating various types of cams for practically any kind of application. The company's cam production facilities and design service are outlined. 35

PRESSURE RECORDERS—Foxboro Co., Foxboro, Mass. Bulletin 6-10, descriptive of Foxboro pressure recorders which are equipped with the new Series 200 pressure elements. Suggestions are made on how to select the measuring element for these instruments. 36

CUTTING AND WELDING PRODUCTS—Air Reduction Sales Co., New York City. General Products Catalogue ADC-662B, 52 pages describing Airco gases, welding and cutting equipment, and accessories. How each item operates is explained, as well as the job for which it is best suited. 37

THREAD COMPARATOR—Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. Circular 570, on the P & W Tri-Roll comparator for checking externally threaded parts. Specifications are given and four types of gaging rolls are described. 38

ROTARY SWAGING MACHINE—Torrington Co., Torrington, Conn. 38-page catalogue describing various models of the Torrintgon swaging machine, and illustrating typical examples of work being done on them. Also considered are popular swaging die designs. 39

ALLOY-STEEL CHAIN—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Folder entitled "Quick Facts About Chain," giving specifications and working load limits for the Taylor Made line of alloy-steel chain especially manufactured for lifting purposes. 40

MOLDED PLASTICS—Dayton Rogers Mfg. Co., Minneapolis, Minn. Bulletin giving quick facts on short-run molded plastics. A cost analysis is given for six jobs produced at the company's plant which is devoted to mold making and plastic molding. 41

STRAIGHT-SIDE SINGLE CRANK PRESS—E. W. Bliss Co., Canton, Ohio. Catalogue 9-D, describing and illustrating Bliss S-1 presses with capacities ranging from 50 to 400 tons. Dimensions are given. Several types of Bliss clutches are shown. 42

STAINLESS-STEEL SPECIFICATIONS—Star Stainless Screw Co., Paterson, N. J. Chart listing United States Government specifications for stainless-steel fastenings, such as machine screws, set-screws, rivets, taper pins, and cotter pins. ...43

VERTICAL MILLING MACHINE—Reed-Prentice Corporation, Worcester, Mass. Bulletin illustrating and describing the Reed-Prentice No. 4 heavy-duty, vertical milling machine, which features electronic control for all feeds. Specifications are given. 44

LATHE DUPLICATING ATTACHMENT—D. C. Caufield Copy-Master, Manchester, Conn. Leaflet describing a new

(Continued on next page)

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portable device for duplicating on engine lathes. Also described are the company's engineering and template services. . .45

POWER TRANSMISSION PRODUCTS—Morse Chain Co., Detroit, Mich. Catalogue B20-53, descriptive of Morse mechanical power transmission products—silent chain drives, roller chain drives, couplings, drive-shafts, and clutches. .46

METAL-WORKING FACILITIES—Morton Mfg. Co., Muskegon Heights, Mich. Bulletin 48, illustrating the company's metal-working facilities for building draw-cut machine tools, special machinery, and automatic welding machines. 47

HOT-WORK STEEL—Firth Sterling, Inc., Pittsburgh, Pa. Catalogue Section 10-280, on CYW Choice, a chromium-alloy, hot-work steel developed for dies and other tools which are subjected to heavy pressure while in contact with hot metal. 48

WORM-GEAR DRIVES—Cleveland Worm & Gear Co., Cleveland, Ohio. Booklet entitled "Keep 'em Rolling with Cleveland Worm Gear Drives and Speed Reducers," presenting several case histories of applications in different industries. 49

CONVEYOR UNITS AND SYSTEMS—W. F. & John Barnes Co., Rockford, Ill. Booklet illustrating and briefly describing how twenty-seven materials-handling problems were solved with Barnes mechanized, "tailor-made" units in various industries. 50

UNIVERSAL JOINTS—Curtis Universal Joint Co., Inc., Springfield, Mass. Catalogue C3, containing purchasing and engineering information on fourteen stock sizes of Curtis joints, and giving some hints for design engineers. 51

TIME DELAY RELAYS—A. W. Haydon Co., Waterbury, Conn. Bulletin A.W.H. TD401, descriptive of a new line of adjustable, hermetically sealed, time delay relays produced especially for military applications requiring reliable operation under severe environmental conditions. 52

DIE-HEADS ON CHUCKING MACHINES—Eastern Machine Screw Corporation, New Haven, Conn. Bulletin 17, describing an application of H&G insert chaser die-heads on the Goss & DeLeeuw "One-Two-Three" chucking machines. Drawings show typical set-ups. 53

FACILITIES FOR PRODUCTION PARTS—Rockford Tool & Die Works, Inc., Rockford, Ill. Folder descriptive of the company's facilities for manufacturing tools, dies, jigs, fixtures, and special machinery. 54

DRILL UNIT—Dumore Co., Racine, Wis. Folder 1019 describing the new Series 24 automatic self-contained drill unit. Details are given as to physical dimensions, motor control, capacity, and lubrication. 55

FROZEN MERCURY PROCESS FOR CASTINGS—Mercast Corporation, New York City. Booklet showing basic steps of the frozen mercury process for producing large, complex precision castings. ...56

MANUAL FEED DRILL PRESSES—Electro-Mechano Co., Milwaukee, Wis. Folder descriptive of the Electro-Mechano 8-inch manual feed drilling press designed for the economical drilling of small holes. 57

COMBINATION OF FORCING AND STRAIGHTENING PRESS—Stanley H. Holmes Co., Chicago, Ill. Manual on the Holmes combination hydraulic forcing and straightening press, giving construction details and specifications. 58

MEASURING INSTRUMENTS—Farrand Optical Co., Inc., New York City. Bulletin 818, describing two models of the Farrand interference microscope for measuring surface roughness and finish. ...59

HYDRAULIC CONTROL VALVES—Logansport Machine Co., Inc., Logansport, Ind. Catalogue 200, Section 4, on eight new hydraulic control valves with ball detent for position locking. 60

MULTI-V BELTS—B. F. Goodrich Co., Akron, Ohio. 76-page engineering handbook on multi-V drives. Designs, belt sizes, stock drives, and horsepower ratings are covered. 61

AUTOMATIC CONTROLS—Reeves Pulley Co., Columbus, Ohio. Bulletin M-542, describing how the Reeves auto-pneumatic control operates and showing typical automatic process applications. 62

CENTER HOLE CHART—Ready Tool Co., Bridgeport, Conn. Chart giving specifications for center holes to be provided in work-pieces for support in grinding machines. 63

WORM-GEAR SPEED REDUCERS—Winsmith, Inc., Springville, N. Y. Bulletin HW 654, on a new line of Winsmith worm-gear speed reducers which are within a range of 1/100 to 5 H.P., in ratios of 5 to 1 to 60 to 1. 64

FREE-MACHINING TOOL STEELS—Vanadium-Alloys Steel Co., Latrobe, Pa. Folder giving compositions, heat-treatment, and uses of various grades of Vasco high-speed and die steels with free machining additives. 65

TUNGSTEN—Sylvania Electric Products Inc., New York City. Manual NP-243, devoted to the manufacture, properties, and uses of tungsten. A flow chart shows how Sylvania tungsten is manufactured. 66

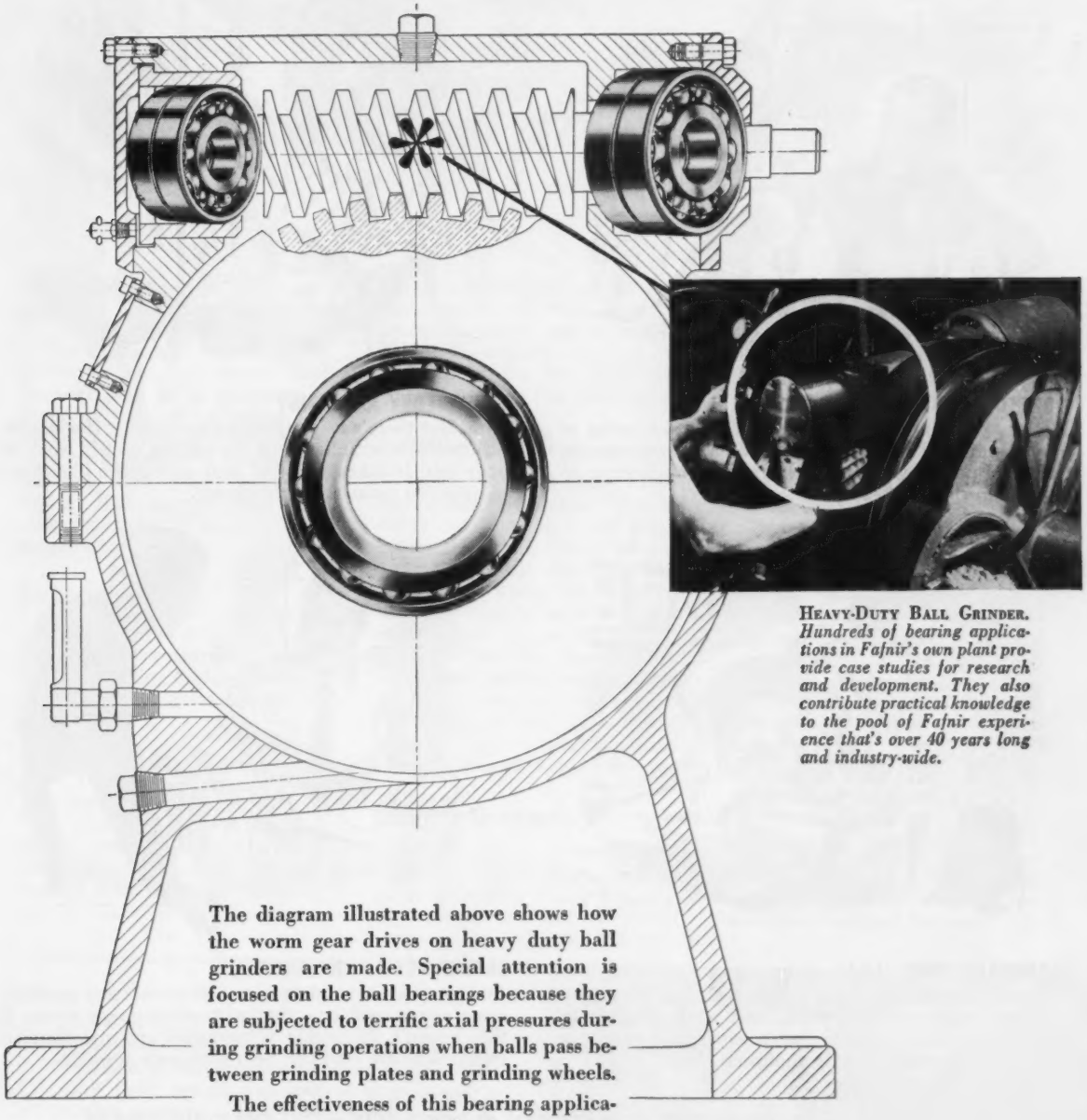
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HEAVY-DUTY BALL GRINDER. *Hundreds of bearing applications in Fafnir's own plant provide case studies for research and development. They also contribute practical knowledge to the pool of Fafnir experience that's over 40 years long and industry-wide.*

The diagram illustrated above shows how the worm gear drives on heavy duty ball grinders are made. Special attention is focused on the ball bearings because they are subjected to terrific axial pressures during grinding operations when balls pass between grinding plates and grinding wheels.

The effectiveness of this bearing application is a matter of record. On the worm gear shaft illustrated, the duplex pairs of bearings have been in operation for 16 years without replacement . . . protecting the worm gear by rigidly locating its shaft and affording adequate carrying capacity for the combined radial and heavy thrust loads.

If you have similar equipment, maybe we can help extend its service life. The Fafnir Bearing Company, New Britain, Conn.

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MOST COMPLETE LINE IN AMERICA

How to Pick the Right Cutting Oil



WORD OF MOUTH?
It gives you the answer sometimes, but not many of your friends have the same cutting oil requirements and the same problems that you have. It's much surer to depend on specialists like Sun.



LABORATORY ANALYSIS?
Sure. But there's no formula for correlating the laboratory analysis with how well the cutting oil will work on your job. It takes years of field experience like Sun's to help you make the right choice.



ELABORATE SHOP TEST?
This will probably give you the answer. But it's expensive and interferes with production when you try to test all the oils available. Sun's experience can help keep your shop-testing to a minimum.



EXPERIENCE IS THE ANSWER.
And Sun has it. Its field representatives have probably come across problems similar to yours many times. If they haven't, its cutting oil specialists and metallurgical technicians are ready to help with your problem.

Soluble or straight, transparent or black, light or heavy duty — Sun makes the kind of cutting oil you need to handle your job at the lowest cost. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-10.

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Refiners of famous High-Test Blue Sunoco Gasoline

For more information on products advertised, use Inquiry Card, page 243



Between Grinds

By E. S. Salichs

Steel Sheets and Bed Sheets

Our Editor was recently going through the Bethlehem Steel foundry and while stamping a layer of dust off his shoes, facetiously remarked to his escort, a young engineer, "I suppose you have to wash your feet every night." The answer came back quick enough: "I do, if I want to get into bed!"

Spikes on Dikes

Dick Lurie, *American Exporter* editor, reports witnessing the first floating flower show held in Amsterdam. Quite a sight, he says.

Orphan Ore?

In an article "Taming Titanium" (*Ryan Reporter*), titanium was dubbed a "maverick metal." On that we hopped to the dictionary. S. A. Maverick, it seems, was a Texas cattle owner who did not brand his calves. The word maverick, then, came to be the nickname for a motherless calf—usually adopted and branded by the first cowherder to lay hands on the bovine baby.

Primitive Puddling

Back in 1646, the Saugus Ironworks was established ten miles north of Boston. Its eighty colonial workers who successfully turned out about 150 tons of cast and wrought iron a year until 1670 could little dream of what was to happen on September 17, 1954. On that day, the nine-billion dollar iron and steel industry celebrated the complete restoration of the Saugus plant, opening its recognized birthplace to the public as a museum.

Glaring Gourmets

A household refrigerator equipped with an electric eye for opening the door ceased functioning during one of the recent hurricanes on Long Island. Until electrical service was resumed forty-eight hours later, we visualized the hungry family grouped around, with another element beaming from their eyes—fire.

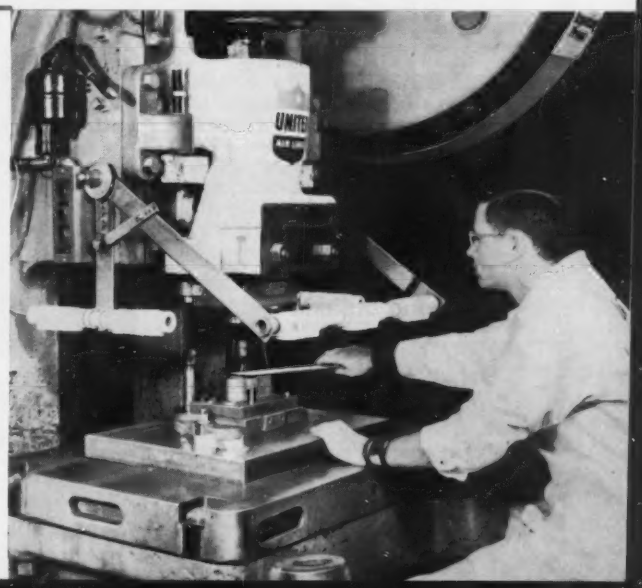
Light and Airy

An aluminum penthouse, first of its kind in New York City, was recently erected on the Continental Can Building to house an air-conditioning unit for nine floors. Subways beneath the building prevented using the basement, and a steel structure on the roof would have weighed too much—61 tons as against the 22 tons of the aluminum cooling tower, according to the *Aluminum Bulletin.*

Baby Dear or Gear

It is told that a specialist on gears, engrossed in writing a book devoted to this complicated subject, had his newly born daughter baptized Involute.

BIKINI BRACELETS—There is a story behind these radioactive leather wristbands. M. E. Simonton, president of the Hazatrol Corporation, San Francisco, Calif., witnessed an unfortunate accident to a worker operating a power press brake. Investigating, he found that no available guard could be applied to many press brake operations. So he and Jack Yeiser, V.P. in charge of engineering, devised the HC safety control, which embodies the use of the radioactive wristbands working in connection with Geiger tubes to stop the press if the operator's hands enter the danger area. Should the worker remove his bracelets, the press also becomes inoperative because the tubes can detect this, too. Mighty smart—as well as safe!



News OF THE INDUSTRY

California and Texas

THOMAS R. LAWSON has been named sales manager for the Sunnyvale, Calif., manufacturing plant of the Westinghouse Electric Corporation, Pittsburgh, Pa. Mr. Lawson comes to this newly created position from Westinghouse headquarters at Pittsburgh, where he was assistant sales manager of industrial products.

ALBERT W. AGNEW has been named district manager of the El Segundo and Berkeley, Calif., field offices by Vickers, Inc., Detroit, Mich. Mr. Agnew will have charge of sales of Vickers industrial and mobile products in the Los Angeles, San Francisco, San Diego, Salt Lake City, and Phoenix areas.

BRUCE E. ELLITHORPE was recently appointed director of advertising and public relations for the Axelson Mfg. Co. Division, Pressed Steel Car Co., Inc., Los Angeles, Calif. In this capacity, he will be responsible for Axelson's four divisions—petroleum equipment, lathes, aircraft components, and foundry.

JOHN M. DOLAN has been named to the newly created post of vice-president—sales of the Solar Aircraft Co., San Diego, Calif. Mr. Dolan was formerly vice-president, general sales manager, and a director of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

ROBERT L. EARLE has joined the Marquardt Aircraft Co., Van Nuys, Calif., as vice president—administration—and assistant to the president. Mr. Earle was formerly with the Curtiss-Wright Corporation for twenty-one years.

GEORGE BEACH has been promoted to the position of assistant to the sales manager in the south central sales division of the Cleco Pneumatic Tool Co., a division of the Reed Roller Bit Co., Houston, Tex. Headquarters for the sales division are at the Cleco plant in Houston.

Illinois and Indiana

VERSON ALLSTEEL PRESS CO., Chicago, Ill., has begun construction of a $1,500,000 addition to its plant facilities at 93rd St. and Kenwood Ave. The building will house the Fabricating Division, which produces weldments for the Verson line of stamping presses and other heavy machinery.

DELUXE SAW & TOOL CO., High Point N. C., a subsidiary of the Rockwell Mfg. Co., Pittsburgh, Pa., has opened a sales office at 6459 N. Neva Ave., Chicago, Ill. ROBERT L. FORD who has been a sales engineer with Deluxe, has been appointed Midwest regional manager.

MICHAEL D. BARNETT has joined the Carboloy Department of General Electric Co., Detroit Mich., as a sales representative for the midwestern district. He will reside in the Chicago area.

MORRIS TYCHMAN has been named sales representative in the Chicago area by the American Buff Co., Chicago, Ill.

EARL J. CLARK has joined the Set Screw & Mfg. Co., Bartlett, Ill., in the capacity of general sales manager.

MELRAY MFG. CO. has begun operation of a short-run stamping service at 9240 Chestnut Ave., Franklin Park, Ill.

KENNETH P. MARTIN has been appointed general sales manager of the National Automatic Tool Co., Inc., Richmond, Ind., in which capacity he will handle all sales activities under the direction of the vice-president. Mr. Martin was formerly sales manager of the Process Machinery Division of the Cincinnati Milling Machine Co., and had also been part owner and general manager of the Hydroform Corporation, having developed the Hydroform machine.



Kenneth P. Martin, general sales manager of the National Automatic Tool Co., Inc.

Michigan

MUELLER BRASS CO., Port Huron, Mich., announces five promotions in its sales department: ROBERT L. GIBBS, assistant general sales manager; ELBERT A. FAIRCHILD, assistant to the general sales manager; PAUL L. CRAFT, manager of the sales promotion department in the industrial division; CHARLES R. BLACK, manager of the wholesale distributing division; and RICHARD S. THOMPSON, assistant to Mr. Black. ELGIN F. PARKER, manager of the industrial division since 1940, has resigned from this position to become vice-president of Bralco Metals, Los Angeles, Calif., a distributing firm.

JOHN HALLER has recently organized Haller-Inc., 684 Ann Arbor Road, Plymouth, Mich., to handle sales and engineering connected with hydraulic and mechanical presses for powdered metal and plastic processing. Mr. Haller was formerly vice-president in charge of research and engineering at the Allied Products Corporation, Detroit, Mich.

DALE BETHKE has been appointed a sales representative for Michigan by J. H. WILLIAMS & CO., Buffalo, N. Y., manufacturers of industrial and automotive wrenches, tools, and drop-forgings. Mr. Bethke, who will make his headquarters in Detroit, has represented the company for a number of years in Oklahoma, Arkansas, and Louisiana.

WILLIAM F. WILSON has been appointed vice-president in charge of engineering and manufacturing by the Gear Grinding Machine Co., Detroit, Mich. In this capacity, Mr. Wilson will have charge of all engineering and manufacturing operations of all the company's divisions, including the new Screw Machine Division.

H. J. CRAIN has joined the Modern Industrial Engineering Co., Detroit, Mich., in the capacity of a

Save Assembly Time...

G.S. SMALL GEARS are widely known for the *impressive* savings they make. Savings in money and time and temper in *so many* assembly lines. ★ *Extreme uniform accuracy* in runs of hundreds or thousands is the unique advantage you get in G.S. GEARS. Rejects drop to an all time low. Downtime disappears. Production flows smoother and faster. Profits mount thru lower costs . . thru the greater satisfaction and service your product gives! ★ You'll benefit, too, by using the vast G.S. experience gained through 38 years of specializing in making better Small Gears exclusively. Tell us exactly what you need . . preferably while the job is on the boards. Our capable craftsmen will be quick to lend you every possible aid.



GET G.S. TECHNICAL DATA *Free!*

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

FRACTIONAL HORSEPOWER GEARING

GS

GEAR

Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS
OF FRACTIONAL HORSEPOWER GEARING

sales engineer. He will work out of the company's main office. Mr. Crain was formerly a master mechanic and chief tool designer for the Packard Motor Car Co.

E. C. GRAVES, superintendent of fabricating in the Carboloy Department of General Electric Co., Detroit, Mich., has been named superintendent of product manufacturing. Mr. Graves has been with Carboloy since 1934.

FLEX-O-TUBE DIVISION OF MERIDAN CORPORATION, manufacturer of flexible hose assemblies and fittings, has moved from Detroit to a new plant on a 10-acre site at 2525 Jim Daly Road, Inkster, Mich.

HUGH GIBBONS has joined the Michigan Steel Casting Co., Detroit, Mich., in the capacity of supervisor of the Rx Met Division. Mr. Gibbons was formerly plant superintendent of the Cannon Muskegon Corporation.

HAROLD F. MARSH has been elected president of the General Mfg. Co., Detroit, Mich., while F. C. HOSSIE, founder of the Company and designer of flexible power presses, has been elected secretary.

NORTHERN ENGINEERING WORKS, manufacturer of overhead traveling cranes and electrical hoists, has recently completed a building expansion program at its plant, 210 Chene St., Detroit, Mich.

RUSSELL B. ROBINS has been named director of marketing and merchandising by the L. A. Young Spring & Wire Corporation, Detroit, Mich. Mr. Robins was formerly with the Ford Motor Co.

R. C. MAHON CO., Detroit, Mich., has just completed another expansion program, having recently added some 130,000 square feet of factory space and 20,000 square feet of office space to its plant.

WILLIAM C. DECKER, president of the Corning Glass Works, Corning, N. Y., has been appointed a director of the Allied Products Corporation, Detroit, Mich.

WILSON L. YOUNG, assistant service manager at the Colonial Broach Co., Detroit, Mich., has been promoted to chief service engineer.

New England

JOSEPH E. SMITH, JR., has been appointed manager of the Gage and Spindle Division of the Bryant Chucking Grinder Co., Springfield, Vt. The administration of this division will be separated from that of the company's machine tool production of precision internal grinding and boring machines. Accordingly, Mr. Smith's responsibilities will include coordination of the sales, engineering, and manufacturing of Bryant's gage product line and rotational equipment for special industrial applications. Mr. Smith has been with Bryant since 1953, prior to that having been assistant factory manager of S K F Industries, Philadelphia, Pa.



Joseph E. Smith, Jr., Manager of the Gage and Spindle Division at Bryant Chucking Grinder Co.

BERNARD L. WARD, formerly chief of machine design at the Fellows Gear Shaper Co., Springfield, Vt., has been appointed assistant chief engineer. Mr. Ward will continue to be responsible for machine design, with HARRY KING as his assistant in that department. HENRY G. STONE has been named chief of tool design, with CARL H. PARKER as his assistant. J. L. WILLIAMSON has been made chief of research, with ROLAND SEAVEY as his assistant.

JOHN COOK, grinding department foreman, retired recently after forty-three years of service with the Norton Co., Worcester, Mass. For many years Mr. Cook was a demonstrator and salesman of Norton machines, and at one time served as district manager in the Philadelphia and Syracuse areas. He also contributed many articles on better grinding in *Grits and Grinds*, the company's monthly house organ. He will be succeeded by STEWART O. BAILEY. Mr. Bailey has been with the Norton Co. since 1937 and was acting general foreman prior to his present appointment. Also announced were several changes in the sales personnel, as follows: CHARLES M. WELLONS, formerly a field engineer at the Philadelphia, Pa., district office, has been named an abrasive engineer in the Philadelphia territory, a position previously held by the late A. Watson Gough; ROBERT C. DIVOLL, who was a field engineer in Pittsburgh, has been appointed an abrasive engineer there, the position he vacated now being filled by CHARLES R. GARFIELD; WILLIAM J. MAHAN has been named a field engineer for abrasive grain applications in New England (except Connecticut) and upper New York State, while JOSEPH F. HARTL, who was abrasive grain engineer for all of New England and upper New York State, will now hold this position for Connecticut.

CONTINENTAL SCREW CO., New Bedford, Mass., announces the following sales appointments: RAYMOND J. DEVER, for New Jersey and part of New York City; LEONARD A. ASHWORTH, for the remainder of the New York City area and Connecticut; and HENRY J. PURRINGTON for Maine, New Hampshire, Vermont, Western Massachusetts, and eastern New York State.

LODDING INC., Worcester, Mass., has named three new sales representatives: TOOLS INCORPORATED, 86 Bethlehem Pike, Philadelphia, Pa.; ROBERT S. WILLIAMS, JR., Towson, Md., for the Baltimore area; and J. L. PETZ CO., Pleasant Valley, N. Y., for Poughkeepsie, N. Y., and environs.

NEW DEPARTURE DIVISION of General Motors Corporation, Bristol, Conn., announces the appointment of the following men in the sales department: ROBERT H. WILKIE, formerly manager of advertising and sales promotion, becomes eastern regional sales manager; JAMES P. GILLILAN, who was eastern regional sales manager, assumes the position of assistant to the sales manager; and ROBERT E. RANDEL succeeds Mr. Wilkie in charge of advertising and sales promotion. Mr. Randel was supervisor of marketing services.

GEORGE S. CHIARAMONTE, sales manager of the Horton Chuck Division of the E. Horton & Son Co., Windsor Locks, Conn., has been appointed to the newly created position of general sales manager of the company. In this capacity Mr. Chiaramonte will be responsible for directing the sales of both divisions of the company—Gabb Special Products and Horton Chuck.

MARC BENDICK has been elected president of the Barnaby Mfg. Co., Inc., Bridgeport, Conn., succeeding BARNABUS TOTH, who has retired. Mr. Bendick recently headed Bridgeport Industries, fabricators of aircraft parts. Also announced was the election of LOUIS F. KUTSCHER to the position of sales manager, and HAROLD SAUNDERS to that of superintendent.

JOSEPH M. KALINS has announced the formation of his own machine

(*Continued on page* 257)

the DeLaval Separator Company.....

OF POUGHKEEPSIE, NEW YORK

emphasizes TWO IMPORTANT POINTS about their several

SIDNEY LATHES

THE SIDNEY MACHINE TOOL COMPANY
50th year
of service to AMERICAN INDUSTRY
1904 - 1954
SIDNEY • OHIO

1.
"It has an extremely solid construction which gives a good finish so that very little polishing is necessary."

2.
"It has been accepted by our operator and personnel within the department as a machine of clean, rugged design."



LET SIDNEY LATHES *PROVE THEIR* SUPERB PERFORMANCE *IN YOUR PLANT*

•

MORE WORK PER HOUR..
AT
LOWER COST PER HOUR

THE DELAVAL SEPARATOR COMPANY USES

SIDNEY FLUID TRACER LATHES

to make form punches and dies . . . with the satisfactory results mentioned in their comments. All Sidney Lathes are designed throughout to provide unusual strength which insures long life and years of satisfactory performance.

Write for Bulletins

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

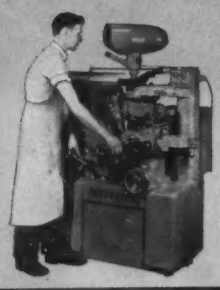
Builders of Precision Machinery since 1904

SHEFFIELD MACHINE TOOLS guard *PRECISION* in the shop



Micro-form Grinder, Model 121 grinds high precision profiles both flat and circular directly from large scale drawing, saving up to 75% over conventional practice.

14



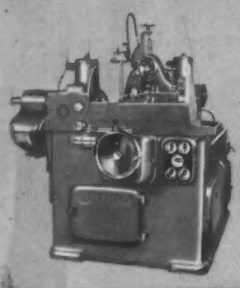
Micro-form Grinder, Model 122 equipped with a combination 30 power microscope and viewing screen.

15

Thread and Form Grinder, Model 133 uses the multi-ribbed wheel principle to grind small precision threads and intricate forms on a high production basis.

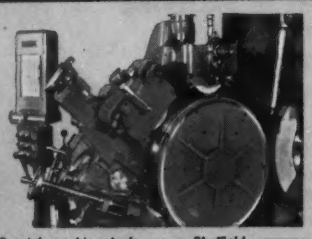


16



Precision Thread and Form Grinders —100 Series, produce precision threaded elements and cylindrical forms by the Crushtrue method, the diamond dressed multi-ribbed wheel or the single point wheel method.

17



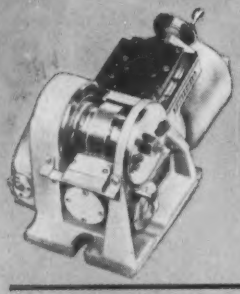
Special machine tools are a Sheffield specialty, such as this one of 12 jet turbine shroud grinders placed in operation within the last six months.

18



Idler and motorized type Crushtrue devices are available for forming grinding wheels on standard surface grinders.

19



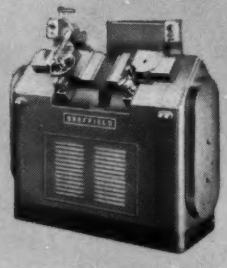
Self-truing Motorized Crushtrue Device forms surface grinder wheels for the grinding of flat form tools, etc. of the highest precision and uniformity.

20



The Sheffield Crushtrue Roll Bank plan provides Rolls for production use while worn rolls are enroute to Sheffield for re-grinding and re-ground rolls are enroute from Sheffield for use. Nominal exchange charge.

21



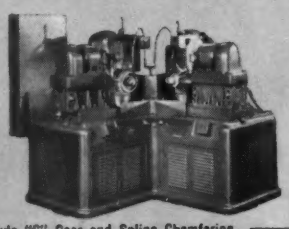
Gear and Spline De-burizers deburr or chamfer up to 600 gear teeth per minute. Applicable to spur, helical, hypoid, bevel and herringbone gears —also multi-start worms.

22



Gear and Spline Chamfering Machines chamfer, burr or recess the ends of gear teeth at high production rates—ideal for short runs and quick changeover.

23



Style "C" Gear and Spline Chamfering machines have two cutter spindles and two workheads for mass production gear manufacture.

24



Sheffield is prepared to produce precision threaded elements and formed parts on contract to augment your own manufacturing facilities.

25

6783

Write for Engineering Data on any or all of these tools identifying them by key numbers in the white squares.

Division 6 • The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

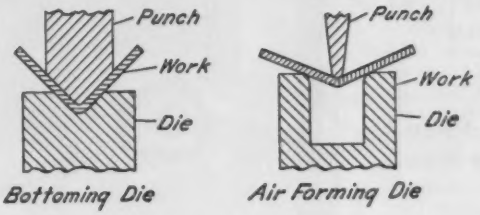
SHEFFIELD

For more information on products advertised, use Inquiry Card, page 243

MACHINERY'S DATA SHEETS 763 and 764

PRESSURE IN TONS PER LINEAR FOOT REQUIRED FOR ANGLE BENDING — 1

Applicable to "Air Forming" Method Used on Press Brake



Basic Methods

Two basic methods are used for forming simple angles on press brakes. These methods are identified as "bottoming" and "air forming." The method used depends on the nature of the product and the accuracy required. Both methods are employed to make obtuse-, acute- and right-angle bends in metal plate or sheet stock. Regardless of which method is used, it is essential that the pressure required for the bending operation be known in order to select a press of the correct size to handle the job without danger of overloading. The accompanying Data Sheet No. 764 and Data Sheets Nos. 765 to 767, to be published in subsequent issues of MACHINERY, have been prepared to facilitate calculating the pressures required for a wide range of shearing and punching operations. They can also be used in determining the tonnage capacity of a press when the rated bending capacity is known.

Bottoming Method

Use of the bottoming method assures consistently accurate forming to the required angle because any irregularities in stock thickness are ironed out by the punch when it forces the stock to bottom in the die. In using bottoming dies, extreme caution must be exercised against overloading the machine, especially when there is considerable variation in the stock thickness.

MACHINERY'S Data Sheet No. 763, October, 1954

Compiled by Verson Allsteel Press Co., Chicago, Illinois

PRESSURE IN TONS PER LINEAR FOOT REQUIRED FOR ANGLE BENDING — 2

Applicable to "Air Forming" Method Used on Press Brake

Air Forming Methods

With the air forming method the punch does not force the stock to bottom in the die member. The opening or slot in an air forming die is machined to an included angle considerably less than 90 degrees. The angle to which the work is formed depends on the depth to which the punch enters the die. Thus a single set of air forming dies can be used to form work to practically any desired angle. Variations in stock thickness, however, result in less accurately formed sections when this type of die is used.

Die Requirements when Forming Angles

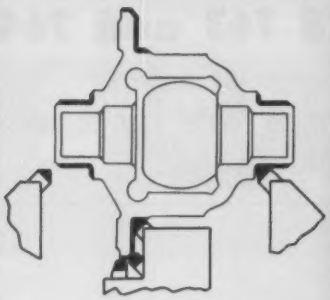
Press brake sizes are based on bending a given thickness of mild steel plate over a die having an opening at the top equivalent to eight times the stock thickness. This is an accepted standard and provides an inside radius equal to approximately 5/32 of the die opening. For example, when forming 1/4-inch stock the die opening should be 2 inches wide. This will provide an inside radius of approximately 0.31 inch. Increasing the die opening reduces the pressure required to make a bend. For instance, a pressure of approximately 15 tons per foot is required to form stock 1/4 inch thick over a 2-inch die opening, whereas, if a 2 1/2-inch die opening is used, only 11.5 tons is required to make the bend. However, in this case, the inside radius will be about 0.39 inch.

When an inside radius that is less than the stock thickness is required, a die having a smaller opening should be employed. However, it is important to carefully check the rated bending capacity of the press brake to make certain that it is ample to withstand the increase in pressure resulting from the use of a smaller die opening. If the tonnage rating of the press brake is not known but the rated bending capacity is known, the approximate tonnage capacity can be determined from Data Sheets Nos. 765 to 767 to be published in subsequent issues of MACHINERY.

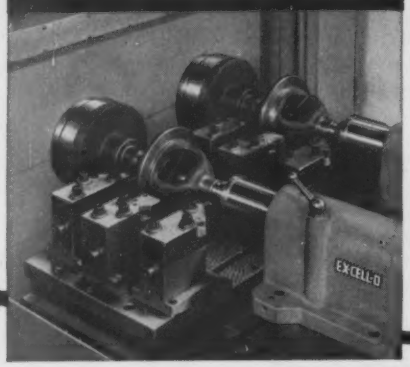
Example — Assume that a machine has a rated capacity for bending a mild steel sheet 10 feet long by 1/4 inch thick. Referring to the chart (Data Sheet No. 765) for the proper die opening, which, in this case is 2 inches, it is found that 14.9 tons pressure is required to bend a piece 12 inches long by 1/4 inch thick or a total of 149 tons for a 10-foot length. Thus it may be assumed that the machine has a tonnage capacity of approximately 149 tons.

MACHINERY'S Data Sheet No. 764, October, 1954

Compiled by Verson Allsteel Press Co., Chicago, Illinois



Heavy lines show the surfaces machined.





Style 112-C Ex-Cell-O Precision Boring Machine with double set-up.

Close-up of the two differential cases, in work position. This precision work is done with hydraulic feeds and easily-controlled automatic cycles.

Insure your Profits...

with DOUBLED PRODUCTION on Ex-Cell-O STANDARD MACHINES

XLO
EX-CELL-O for PRECISION

A NEW APPROACH . . . Turn four diameters—face three shoulders—chamfer one edge. Not one at a time—but *Two!* Not on a double end—but on a single end Ex-Cell-O Precision Boring Machine!

Workpieces are automotive differential cases—precision work—limits of plus or minus .0005" on diameters.

See how Precision Boring Machines can save time and money for you. Call your local Ex-Cell-O representative, or phone or write Ex-Cell-O for a Precision Boring Catalog.

54-21

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS of PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

tool distributing firm—J. M. KALINS, INC., 113 E. Washington Ave., Bridgeport, Conn. ALBERT E. HAND will be associated with Mr. Kalins. Besides handling new and used machine tools, the company will provide engineering services.

READY TOOL CO., Bridgeport, Conn., manufacturer of centers and grinder and milling machine dogs, announces the appointment of the following representatives: ROGER W. KING, 191 Swain Ave., Meriden, Conn.; B. S. MEADE CO., 604 Duquesne Terrace, Union City, N. J.; and HERREN & SIMS CO., 1601 St. Clair Ave., Cleveland, Ohio.

W. H. BLACKBURN was recently appointed to the newly created position of assistant to the president of the Billings & Spencer Co., Hartford, Conn. Mr. Blackburn will also continue his present responsibilities as production manager and purchasing agent.



J. B. Sewell, new general sales manager at Garlock Packing Co.

CHARLES J. HARDY, JR., president of ACF Industries, Inc., New York City, since 1947, was recently elected chairman of the board, succeeding John E. Rovensky who retired some months ago. JAMES F. CLARK, who was vice-president in charge of finance, was elected president.

CHARLES E. WINDHOVEL, JR., has been named a sales representative by the Vanadium-Alloys Steel Co., Latrobe, Pa. He will be located in the central New York state area, working out of the Buffalo office.

LORD MFG. CO., Erie, Pa., announces that its New York regional field engineering office will now be located at 630 Fifth Ave., Rockefeller Center, New York 20, N. Y.

JOHN A. NEYENHOUSE, JR., has been appointed assistant district manager of the United States Steel Supply Division of the United States Steel Corporation at Newark, N. J.

New York and New Jersey

ARTHUR SANSOM, who recently rejoined the E. W. Bliss Co., Canton, Ohio, has been assigned to the sales engineering staff of the Can Machinery Division, which is located in New York City. Prior to this, he was the New York representative for the Fairchild Aircraft Division, Hagerstown, Md. Mr. Sansom was, however, associated with Bliss from 1936 until he joined the Army during World War II. At the time he left, he was a purchasing assistant.

OAKITE PRODUCTS, INC., with general offices at 19 Rector St., New York City, have completed new and expanded Chemical Research Development, Technical Service, and Engineering Laboratories at 350 Hudson St., New York City. These facilities will be used for developing and testing industrial cleaning materials and working out answers to cleaning problems.

ALLEN H. OTTMAN has joined the Rochester Mfg. Co., Rochester, N. Y., being elected executive vice-president, general manager, and a director. The company manufactures gages and other instruments, as well as gun feed mechanisms for the United States Air Force. Mr. Ottman was formerly associated with the American Hard Rubber Co., New York City.

J. B. SEWELL has been appointed general sales manager of the Garlock Packing Co., Palmyra, N. Y. In this capacity, he will direct the sales of Garlock products through twenty-nine divisional offices in the United States and Canada. Mr. Sewell started with the company in 1935 as a salesman for the Montreal area, and twelve years later was appointed vice-president of the Garlock Packing Co. of Canada, Ltd. He now takes over the sales duties of LOUIS MOHN, a vice-president who is on sick leave.

CLIFFORD R. BOECKLER was recently appointed district manager for western New York by the Niagara Machine & Tool Works, Buffalo, N. Y. Mr. Boeckler will head the new sales office, which is located in the company's plant at 683 Northland Ave., Buffalo, serving Niagara and Erie Counties in New York and Erie County in Pennsylvania.

TRUE TRACE SALES CORPORATION, El Monte, Calif., manufacturer of True Trace hydraulic valves, recently appointed the ISLAND MACHINERY CO., Farmingdale, L. I., as representative. The Island Machinery Co. has set up a subsidiary known as True Trace Eastern to cover the East coast.

HOWARD E. LYNCH has been appointed sales engineer in charge of a new office at Buffalo, N. Y., for Danly Machine Specialties, Inc., Chicago, Ill., manufacturer of mechanical presses and die sets. He has been associated with Danly since 1943. The address of the Buffalo office is 1807 Elmwood Ave.

CAPTAIN ROBERT E. W. HARRISON has been appointed director of special engineering projects at the Sintercast Corporation of America, Yonkers, N. Y. Captain Harrison recently retired as an engineer captain of the United States Navy.

JOSEPH P. COSTIGAN has joined the American Machine & Foundry Co., New York City, as works manager at the Buffalo, N. Y., plant. Prior to this, Mr. Costigan was operations manager of the Alloy Rods Co., York, Pa.

Ohio

PHILIP O. GEIER, JR., has been appointed sales manager of the Cincinnati Milling Products Division,



Philip O. Geier, Jr., who is sales manager of the Cincinnati Milling Products Division, Cincinnati Milling & Grinding Machines, Inc.

Cincinnati Milling & Grinding Machines, Inc., Cincinnati, Ohio. Mr. Geier, who has been with the organization for over fifteen years, has been with the Products Division for the last three and one-half years. In his new capacity, he will be responsible for the sale of Cimcool cutting fluids and Cincinnati "positive Duplication" grinding wheels.

R. W. POWELL has been appointed general sales manager of the Ma-



R. W. Powell, new general sales manager of the Machinery Division at Hydraulic Press Mfg. Co.

chinery Division of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This Division includes the Metal-working and Process Press Division, the Plastics Machinery Division, and the Die-Casting Machinery Division. Mr. Powell has been associated with the company for eighteen years in various executive positions. Since 1949, he has been sales manager of the Plastics Machinery Division.

DAVID W. DAVENPORT has been named sales manager of the S-P Mfg. Corporation, Cleveland, Ohio, manufacturer of power chucks, air and hydraulic cylinders, and other equipment for the machine tool, automotive, and aircraft industries. Mr. Davenport was assistant sales manager before his promotion.

MARVIN L. STEINBUCH has been appointed chief metallurgist and research director of the Lunkenheimer Co., Cincinnati, Ohio, valve manufacturer, replacing John W. Bolton, who has resigned. Mr. Bolton directed the company's metallurgical research and testing division for the last twenty-seven years.

WALTER O. LEWIN has been made general manager of the newly acquired Champion Division of the Steel Improvement & Forge Co., Cleveland, Ohio. Mr. Lewin was formerly vice-president and general manager of the Champion Forge Co. DEWARD H. HARDESTY has been appointed superintendent of the Division.

JAMES E. HOVIS has joined the Gas Machinery Co., Cleveland, Ohio, as a special industrial furnace representative in the steel and metal-working industries. Prior to this, Mr. Hovis was vice-president in charge of sales for the Bloom Engineering Co., Pittsburgh, Pa.

LEES-BRADNER Co., Cleveland, Ohio, has formed a new division to market and service the line of Cri-Dan high-speed threading machines. The new unit, which will be known as the Cri-Dan Division, will be headed by FLETCHER GLEASON, formerly chief processing engineer.

WALTER M. GOLDHAMER, vice-president of the Superior Die Casting Co., Cleveland, Ohio, was the recipient of the Doehler Award for outstanding research leadership made by the American Die Casting Institute at its twenty-sixth annual meeting.

JONES & LAMSON MACHINE Co., Springfield, Vt., announces the appointment of the L. W. HODSON MACHINERY Co., Cleveland, Ohio, as distributor for the Jones & Lamson automatic opening die-heads, chasers, and fixtures.

Pennsylvania and Virginia

WALTER F. LARSON and DONALD E. RUSSELL have been appointed chief engineer and sales manager, respectively, of the new hydraulic equipment department of the Sutton Engineering Co., Bellefonte, Pa. This department will specialize in the manufacture of extrusion presses.

JAMES C. KELLEY has been appointed general manager of the American Machine Tool Distributors' Association, Philadelphia, Pa., which will be his headquarters. Mr. Kelley comes to this post from the United States Department of Commerce, where he was deputy director of the Metal-working Equipment Division. Prior to this, Mr. Kelley was with the Monarch Machine Tool Co., Sidney, Ohio.



James C. Kelley, general manager of the American Machine Tool Distributors' Association



Brigadier General R. W. Daniels (USA Ret.), who is joining the Chambersburg Engineering Co.

BRIGADIER GENERAL R. W. DANIELS, (USA Retired), has joined the Chambersburg Engineering Co., Chambersburg, Pa., in the capacity of adviser on special plans. General Daniels has had wide experience on Army ordnance matters. Among his duties were acting as executive at the Aberdeen Proving Ground, improving manufacturing methods of artillery ammunition at the Frankford Arsenal, and commanding the Letterkenny Ordnance Depot. Last year, he returned from Japan and the Korean campaign, where he served as chief of ordnance for General Matthew B. Ridgway, and later for General Mark Clark.

WILLIAM A. COOLIDGE has been elected a director of the Crucible Steel Co. of America, Pittsburgh, Pa., succeeding W. W. ANDERSON of Detroit, Mich., who resigned because of a Federal government appointment. Mr. Anderson was also chairman of the board of the Trent Tube Co., East Troy, Wis., a wholly-owned subsidiary, from which position he also resigned, this now being filled by WALTER H. WIEWEL, who is vice-president in charge of sales and a director of Crucible. Mr. Wiewel was also president of Trent and was succeeded in that position by FREDERICK E. WENZEL.

W. H. JONES has been appointed representative for southern New Jersey, Delaware, and Virginia by the Cushman Chuck Co., Hartford, Conn. Mr. Jones's mailing address is Box 467, Wallingford, Pa.

CONDE HAMLIN, general sales manager of DeWalt, Inc., Lancaster, Pa., subsidiary of the American Machine & Foundry Co., has been elected vice-president in charge of sales and a director.



This advertisement first appeared about a year and a half ago. It is repeated because the customer has since reported that gasket performance in this rugged service proved extremely successful since adopting gaskets made from Revere Deoxidized Copper Tube.

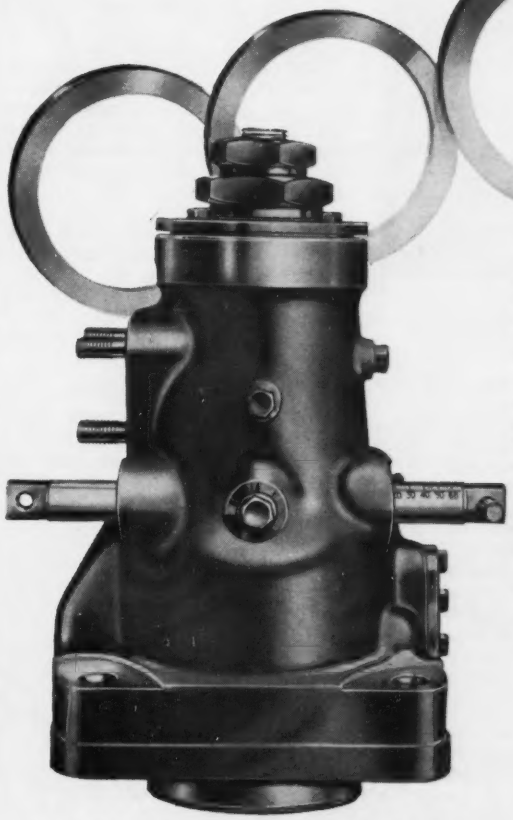
IT PAYS TO CONSULT REVERE.

TO MAKE HEAVY-DUTY COPPER

Gaskets

USE REVERE DEOXIDIZED

Tube!



Diesel Fuel Injection Pump, made by American Bosch Corp., Springfield, Mass., and gaskets made by cutting rings off 2" deoxidized copper tube.

• An important extra service rendered by Revere consists of collaboration in setting up specifications. This is valuable because there are many different Revere Metals, each with special characteristics. No one copper, for example, will serve to best advantage in every application. A case in point is the matter of copper gaskets for Diesel fuel injection pumps. Copper is of course an ideal metal for gaskets, and is widely used for that purpose. But for this special application, which copper and in what form? The pump is used on large engines for municipal generating plants. It weighs 186 pounds, and must produce the high pressure required to inject fuel near the top of the Diesel compression stroke. Naturally, the load is a pulsating one. American Bosch Corporation came to Revere with the problem. Our suggestion was that much scrap could be saved if the gaskets were made by cutting rings off copper tube, instead of stamping them from strip. This achieved a double purpose, since the tube is made of deoxidized copper, which is superior in this application to electrolytic. We are able to report that these recommendations proved successful. . . . This work was done by the Revere Technical Advisory Service. To get in touch with it, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



Andrew Liston, new general sales manager of Eddystone Division, Baldwin-Lima-Hamilton Corporation.

ANDREW LISTON has been appointed general sales manager of the Eddystone Division of Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Mr. Liston has been with Baldwin since 1931, and after several assignments became manager of industrial sales.

S. F. DAVIES and C. B. LEAPE have been appointed sales manager and engineering manager, respectively, for the Micarta Division of the Westinghouse Electric Corporation, Pittsburgh, Pa.

FOXBORO CO., Foxboro, Mass., recently opened a 15,000-square foot plant at 270 Noblestown Road, Pittsburgh, Pa.

LEE R. HERRING has been named a sales engineer in Maryland, Virginia, and the District of Columbia by the Hitchiner Mfg. Co., Inc., Milford, N. H. Mr. Herring resides at 3061 N. Oakland St., Arlington, Va.

Wisconsin

DONALD L. HARRIS has joined the staff of the Davis Boring Tool Division of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., as a field engineer. Mr. Harris was formerly with the Motch & Merryweather Machinery Co.

ROYAL AIRCRAFT CORPORATION was recently formed as a wholly owned subsidiary of the Kearney & Trecker Corporation, Milwaukee, Wis. The concern will manufacture and distribute a gull-wing, twin-engine amphibian airplane called the "Royal Gull."

HANS M. LARSEN, production manager, has been appointed to the newly created post of director of purchases and production planning by the Louis Allis Co., Milwaukee, Wis. Mr. Larsen has been with the company for thirty-five years.

ZAGAR TOOL, INC., Cleveland, Ohio, has established a branch office at 610 W. Michigan Ave., Milwaukee, Wis. E. A. DOMIN, with Zagar for the last ten years, has been appointed branch manager.

Obituaries

Hyman Goldburg

Hyman Goldburg, director of sales and service for the Parker-Kalon Division of General American Transportation Corporation, New York



Hyman Goldburg

City, died on September 1 after a short illness at the age of fifty-two years. He was a member of the Parker-Kalon management since shortly after the founding of the company, starting as an associate of his brother, Louis, in the Kalon Supply Co. In 1925, he became treasurer of the Parker-Kalon Corporation. Following the acquisition of this concern by the General American Transportation Corporation in 1953, Mr. Goldburg continued in the position of director of sales and service. He is survived by his wife and two sons.

ERICH C. WOLLAEGER, manager of the Cleveland and Cincinnati, Ohio, offices of the Oilgear Co., Milwaukee, Wis., died on July 4 at the age of sixty-two years. Mr. Wollaeger joined the company twenty-eight years ago and at the end of his first year became active in the Cleveland territory. He is survived by his wife and two children.

Coming Events

OCTOBER 14-15—TENTH ANNUAL NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS to be held at the Sheraton Hotel, Chicago, Ill. For further information, write to the Illinois Institute of Technology, 35 W. 33rd St., Chicago 16, Ill.

OCTOBER 21-23—Eighth New England Conference of the AMERICAN SOCIETY FOR QUALITY CONTROL at the Ten Eyck Hotel, Albany, N. Y. For additional information, write to Southern Connecticut Section, A.S.Q.C., Box 1681, Bridgeport 1, Conn.

OCTOBER 24-27 — Semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION, at the Edgewater Beach Hotel, Chicago, Ill. Executive secretary, John C. Sears, One Thomas Circle, Washington 5, D. C.

OCTOBER 25-27—Machine Tool Conference of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS at the Statler Hotel, Detroit, Mich. For further information, contact the Institute, 33 W. 39h St., New York 18, N. Y.

NOVEMBER 1-5—Thirty-sixth National Metal Exposition sponsored by the AMERICAN SOCIETY FOR METALS at the International Amphitheatre, Chicago, Ill. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

NOVEMBER 1-5—National fall meeting of the AMERICAN WELDING SOCIETY to be held at the Sherman Hotel, Chicago, Ill. Further details can be obtained by writing to the Society, 33 W. 39th St., New York 18, N. Y.

NOVEMBER 29-DECEMBER 2—First INTERNATIONAL AUTOMATION EXPOSITION to be held at the 244th Regiment Armory, New York City. For further information, write to Exposition, 845 Ridge Ave., Pittsburgh 12, Pa.

DECEMBER 2-7—Twenty-first National Exposition of Power and Mechanical Engineering under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS, at the Commercial Museum, Philadelphia, Pa. For further information write to: Manager, E. K. Stevens, 480 Lexington Ave., New York 17, N. Y.

APRIL 13-15, 1955—Tenth annual Meeting and Lubrication Exhibit of the AMERICAN SOCIETY OF LUBRICATION ENGINEERS at the Hotel Sherman, Chicago, Ill. Administrative secretary, William P. Youngclaus, Jr., 84 E. Randolph St., Chicago 1, Ill.

Reduce Broaching Costs
ON SMALL JOBS



OIL GROOVES
•
SMALL SPLINES
•
SERRATIONS
•
KEYWAYS
•
SLOTTING
•
BURRING
•
SIZING HOLES

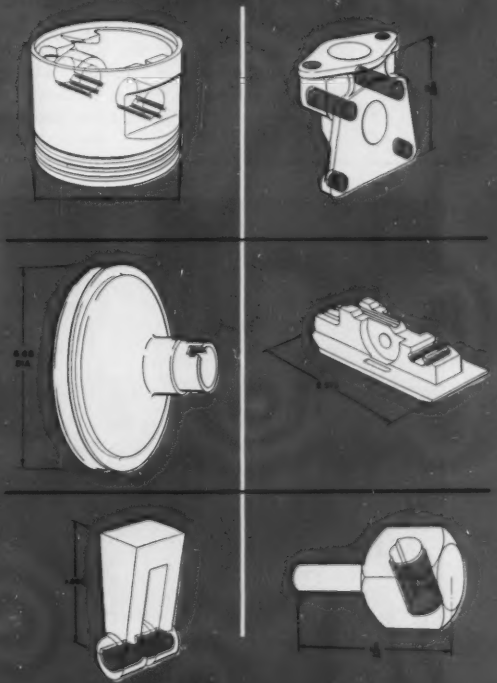
Here is your opportunity to reduce machine time and cut production costs on those small broaching jobs. And you avoid tying up your regular broaching machines which are built for heavier work.

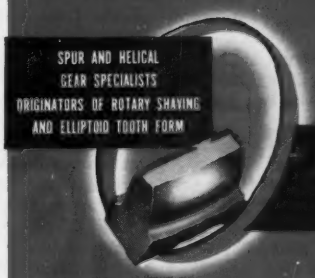
The Red Ring Self-contained Broaching Fixture is a compact, portable, bench-type unit. Specifically designed for a particular job, it has all the elements (automatic and manual) of any well designed fixture. A pneumatic cylinder is added to pull or push the broach. Just connect it with the air supply and you are ready to start broaching.

These Red Ring Fixtures are used on a wide range of small jobs requiring a "Pull" not to exceed 2000 lbs. and a stroke of 25" or less. Here they are highly effective and very economical.

Investigate—talk with a Red Ring Engineer or write for Bulletin B54-9.

6978





SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

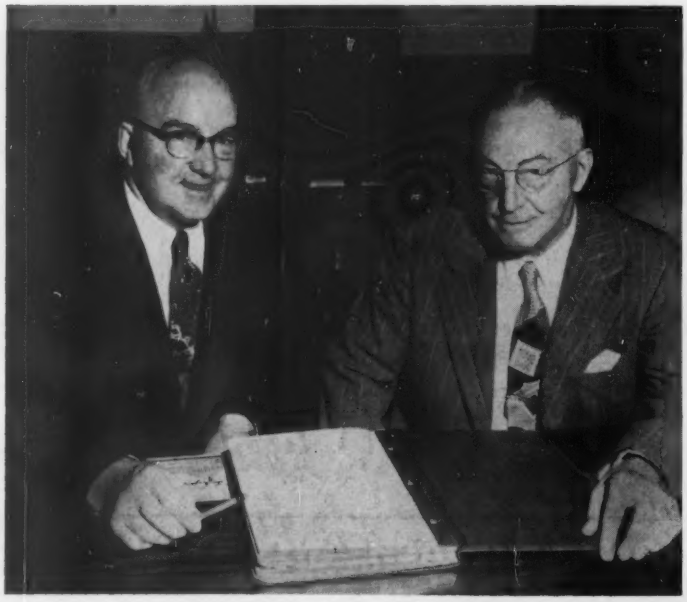
NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Members of the National Machine Tool Builders' Advertising Council who attended the recent conference of the National Industrial Advertisers Association held in Montreal were (left to right) Frank Pensinger, Monarch Machine Tool Co.; Vas Howe, Pratt & Whitney Division Niles-Bement-Pond Co.; Charles Tipton, Cincinnati Milling Machine Co.; Keith Gallimore, Jr., Klau-Van Pietersom-Dunlap, Inc.; Andrew Lindmark, Bullard Co.; Al John, Kearney & Trecker Corporation; Marsh Hanks, Gisholt Machine Co.; Noel O'Daniell, Barnes Drill Co.; and Bill Ginrod, Cincinnati Milling Machine Co. Al John, shown being congratulated, was an award winner.

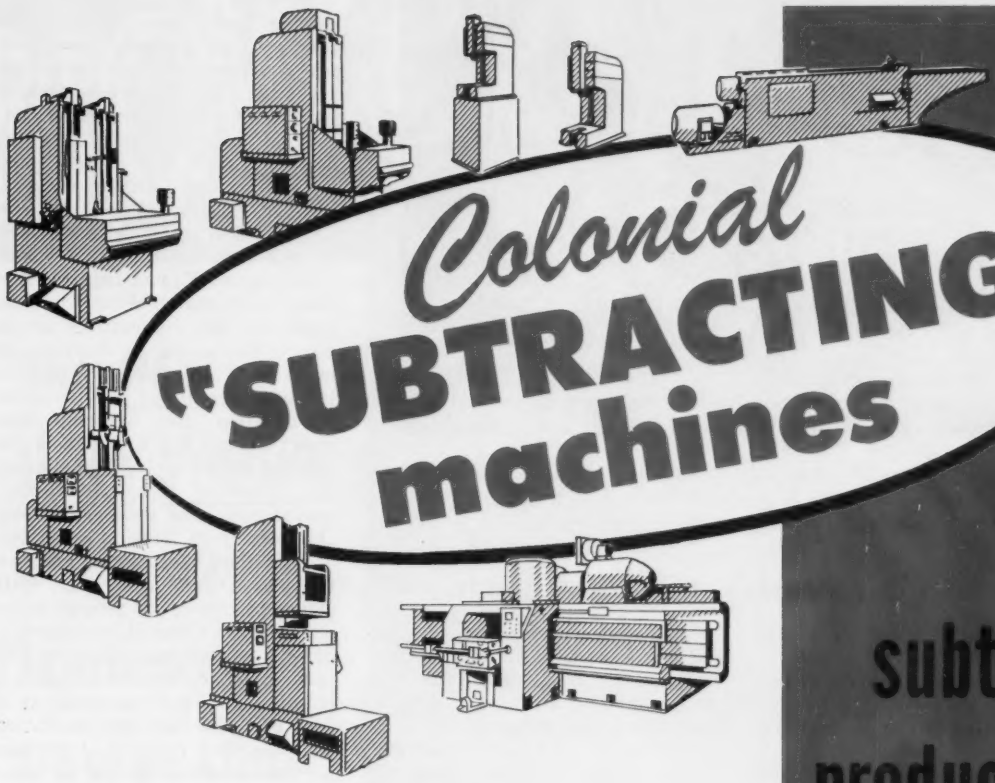


(Left) Thomas W. Pangborn, founder and president of the Pangborn Corporation which recently celebrated its Golden Anniversary, and (right) John C. Pangborn, first vice-president

Pangborn Corporation Celebrates Golden Anniversary

"Fifty Years Partnership with Industry" keynoted the Golden Anniversary activities of the Pangborn Corporation, manufacturer of blast cleaning and dust control equipment, during ceremonies held September 1 and 2 at the home plant in Hagerstown, Md. Employes and distinguished guests paid tribute to Thomas Wesley Pangborn, founder and president of the concern, and his brother, John Clemmer Pangborn, first vice-president. One of the high points of the occasion was the unveiling of a bronze plaque from the more than 1000 employes. Commemorative medals which bore a facsimile of the plant on one side and of the two Pangborn brothers on the other, were distributed to all the employes as keepsakes.

More than 28,000 machines have been built and sold since the concern was started in a small repair shop in downtown New York City, back in 1904. The company moved to Jersey City in 1908, and to Hagerstown in 1912.



Colonial "SUBTRACTING" machines

they subtract production costs ... add to profits

Subtraction #1—the *Broach.* With the Colonial broach designed specifically to broach the part efficiently to the tolerances specified at the required rate of production, cost subtraction starts.

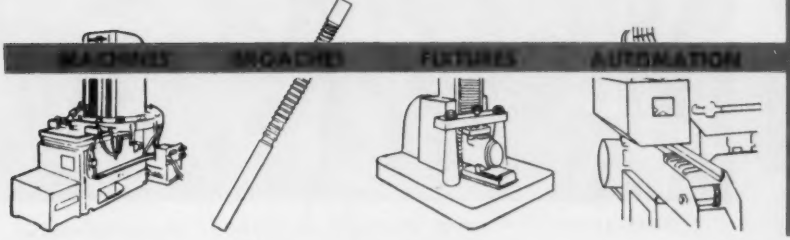
Subtraction #2—the *Machine.* Selecting one of the more than 60 dependable Colonial broaching machines capable of handling the broach at the specified rate of production is the next important step in subtracting costs.

Subtraction #3—the *Fixture.* The Colonial fixture, locating and clamping the part in broaching position, while at the same time permitting maximum accessibility for loading and unloading, is another important step in cost subtraction.

Subtraction #4—the *Automation.* Where high production requirements make loading and unloading time an important factor, the Colonial automation of the broaching installation will serve to further subtract machining costs.

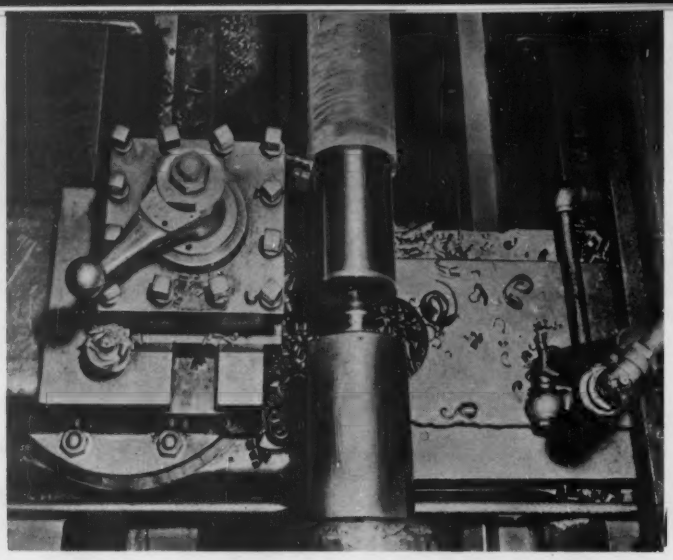
ADDITION—By adding the four important Colonial cost subtracting features above, today's cost conscious metalworking plant has a complete *Colonial Unified Broaching Installation* capable of producing the part at lowest possible cost with utmost accuracy. To subtract costs and add to profits in your plant, ask Colonial Broach to quote on Unified Broaching installations for your parts.

Ask for bulletin 877 on complete line of Colonial broaching machines



Unified Broaching

COLONIAL BROACH CO.



Substitution of a heavy-duty steel-cutting grade carbide increased tool life 40 per cent in roughing and finish machining jet-engine turbine wheel shafts.

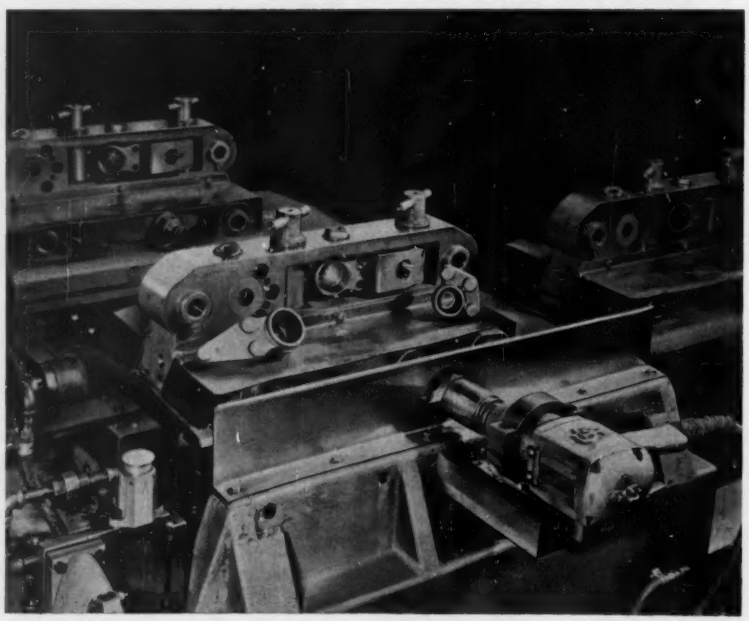
Correct Grade Carbide Increases Tool Life

At the Lynn River Works of the General Electric Co., shifting to a new grade carbide cutting tool for machining jet-engine turbine wheel shafts accomplished four things: (1) It eliminated the use of a special spring-loaded quill that cost $1500; (2) stopped the heat-treated steel forging from elongating; (3) increased tool life by at least 40 per cent; and (4) reduced tool grinding time over 50 per cent.

The job consisted of machining a J47 engine part on a 40-H.P., 36-inch lathe without coolant. Normal operation called for first rough-turning the entire 5 3/4-inch diameter forging, which is made from S A E 4340 steel and has a Brinell hardness from 269 to 321, then repeating the operation with a finishing cut. In the roughing operation, the forging diameter was reduced to 4 1/2 inches with the depth of cut varying between 3/8 and 3/4 inch.

Formerly, two cemented-carbide cutting tools were employed to complete the job—one was used for roughing and the other for finishing. Now the whole task is completed with one cemented-carbide tool—the new cemented carbide Grade 370 recently developed by the Carboloy Department of General Electric Co. The carbide tools previously used ran at red heat estimated at about 1700 degrees F., and required frequent sharpening. Also, the heat generated by the cutting action caused the shaft to elongate as much as 3/16 inch, which caused the bearings in the quill to seize. In addition, tool breakage was heavy—about five to six tools per week at $8 per tool. To counteract this situation, a special spring-loaded quill was devised to keep the work from freezing on center.

With the application of the new tool, both red heat and shaft elongation were no longer problems. Neither was it necessary to depend on the special quill. The carbide tool now used includes a chip-breaker and operates at a feed of 0.018 inch per revolution with the work rotating at 200 feet per minute. Even though the same cutting tool is employed for roughing and finishing operations, it is running three times as long as the former tools. The only regrinding it requires is a slight touch-up from time to time rather than a full grind.

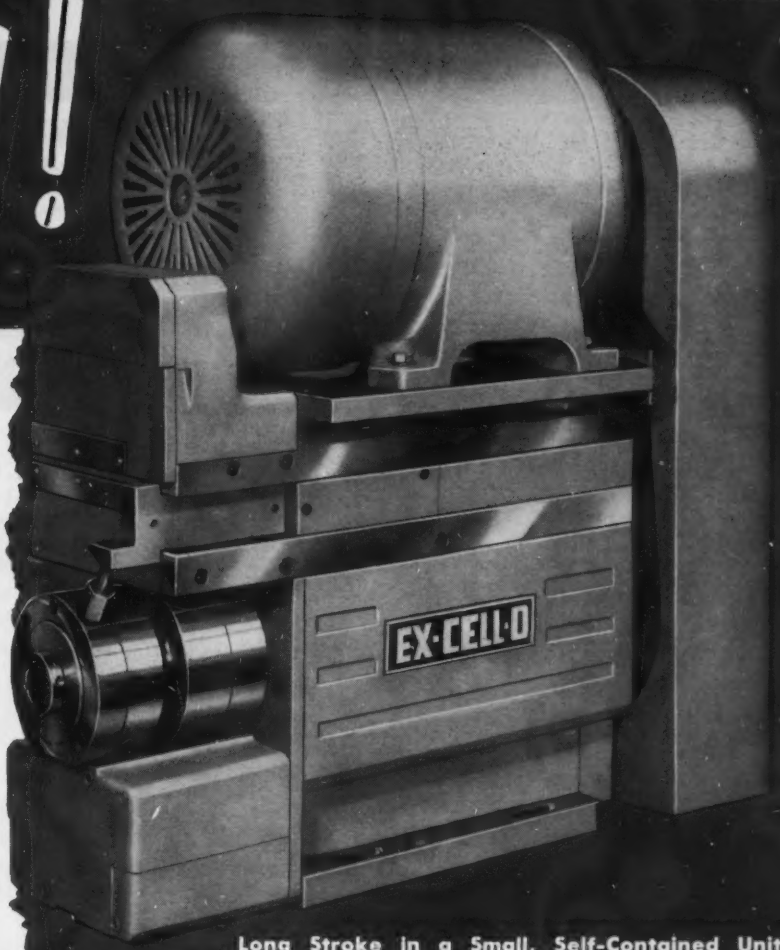


At the loading station of a transfer machine, upper and lower ball joint castings for automobile front end suspensions are power-clamped by means of a Chicago Pneumatic air-operated wrench, which engages a nut at the base of the fixture. The transfer machine, made by the Modern Tool Works Ltd. for the Ford Motor Co. of Canada, performs boring, facing, chamfering, forming, drilling, spot-facing, reaming, and tapping operations at fifteen work stations.

NOW!

The NEW LONG STROKE Style 22 Hydraulic Power Unit

XLO
EX-CELL-O for PRECISION



Long Stroke in a Small, Self-Contained Unit. Ex-Cell-O Style 22 quill-type Hydraulic Power Unit. Capacity, 3 HP; stroke, 8". Style 22-L, 12" stroke.

For special-purpose machines at low cost use these Ex-Cell-O quill-type hydraulic power units to feed, rotate, and retract tools for drilling, reaming, counterboring, and spot-facing.

See your local Ex-Cell-O representative, or write Ex-Cell-O for literature.

IMPORTANT FEATURES

1. Long Stroke in small rugged unit.
2. Flexible automatic cycles.
3. Two infinitely adjustable feed rates.
4. Hydraulic pump externally manifold mounted.
5. Electric and manifolded hydraulic controls enclosed, yet readily accessible.

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

54-31

another
Columbia
press brake feature



specially designed air clutch and brake

Self-adjusting clutch, installed in heavy, balanced flywheel, cushions shock, assures long, trouble-free service. Multiple spring-loaded brake stops ram automatically when clutch is disengaged.

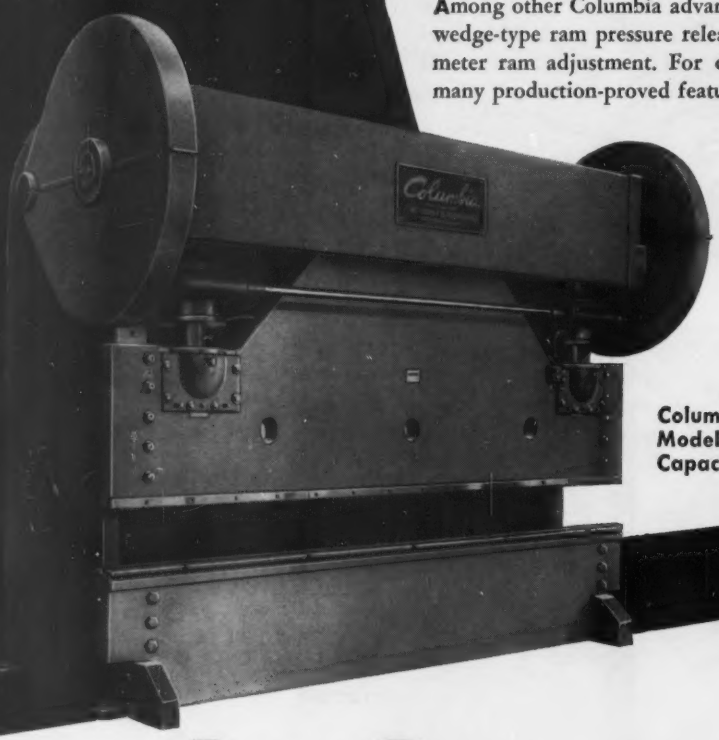
jogging or one stroke ...it's trouble-free

Columbia "New Series" Power Press Brakes incorporate years of experience in the heavy metal working field with time, labor and cost-saving features of the most advanced design.

Typical are the air clutch and spring brake, particularly designed for press brake service. The smooth operating, positive clutch is installed in a heavy, balanced flywheel. Drive to the gearing is by a heavy alloy steel shaft.

When the clutch is disengaged, the disc type friction brake is automatically applied, holding the ram in any position without creeping. The air clutch and brake are available on series 180 and larger size Columbia press brakes.

Among other Columbia advanced design features are the exclusive wedge-type ram pressure release and the motor-operated micrometer ram adjustment. For dependable performance, check the many production-proved features of rugged Columbia Press Brakes.



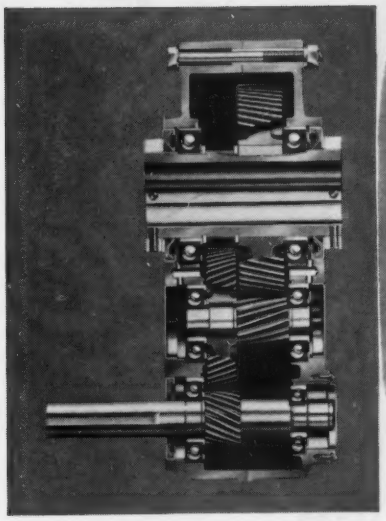
Get the complete story on exclusive Columbia press brake features. Write for new FREE Bulletin No. PB-1 and the name of your nearest distributor.

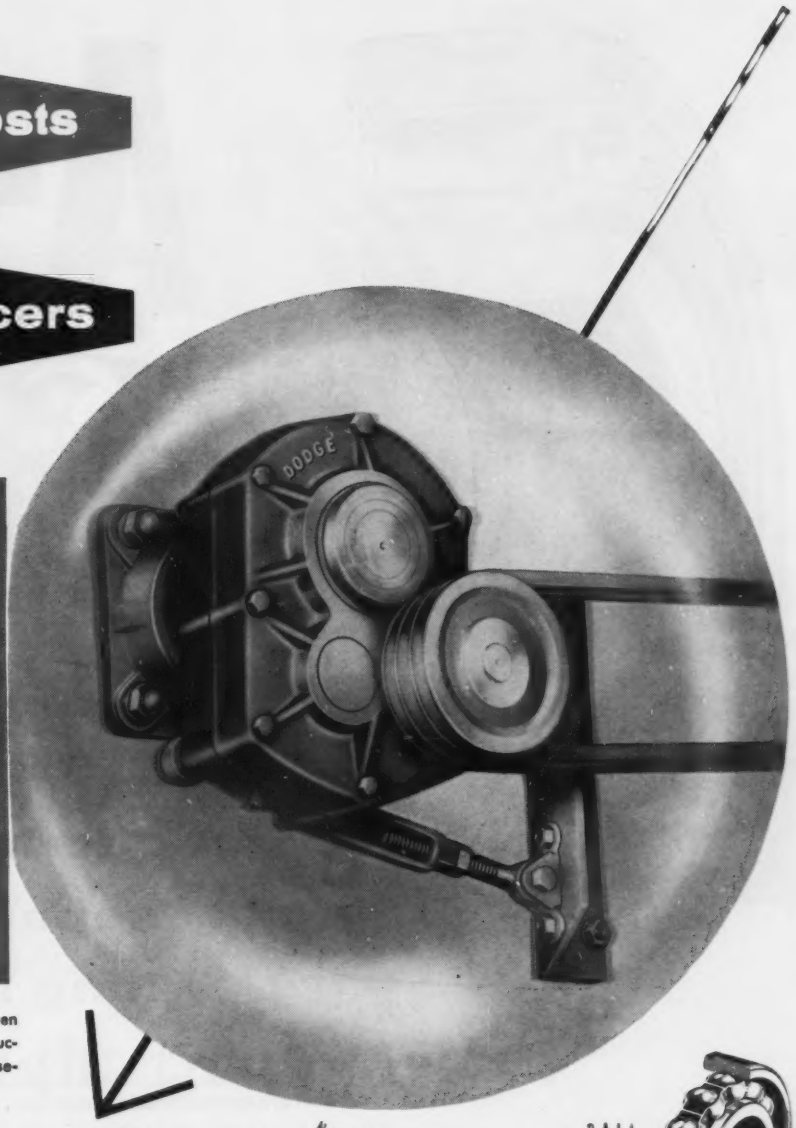
Columbia Power Press Brake, Model 180-12. Capacity, 12′ x ¼″.

COLUMBIA DIVISION THE **Lodge & Shipley** CO HAMILTON 1, OHIO

For more information on products advertised, use Inquiry Card, page 243

Reducing Costs in Speed Reducers





New Departure **ball** bearings are used in seven basic sizes of the Dodge single and double reduction speed reducers, handling from 1 to 43 horsepower at output speeds from 12 to 330 r.p.m.

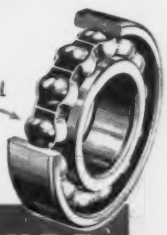
. . . with NEW DEPARTURES

Dodge Manufacturing Corporation's Speed Reducers make good use of design advantages offered by New Departure snap-ring **ball** bearings.

The snap rings locate the bearings in the case, eliminating the need for adjustment. Doing away with threaded or shim-type devices permits straight-through boring of the housing. Thus split-case construction is highly practical, and assembly is greatly simplified. The result is a rigid, highly efficient unit, and one in which production costs have been kept to the minimum.

Learn what New Departure can do for *your* product. Talk with your New Departure sales engineer—*today!*

NOTHING ROLLS LIKE A BALL



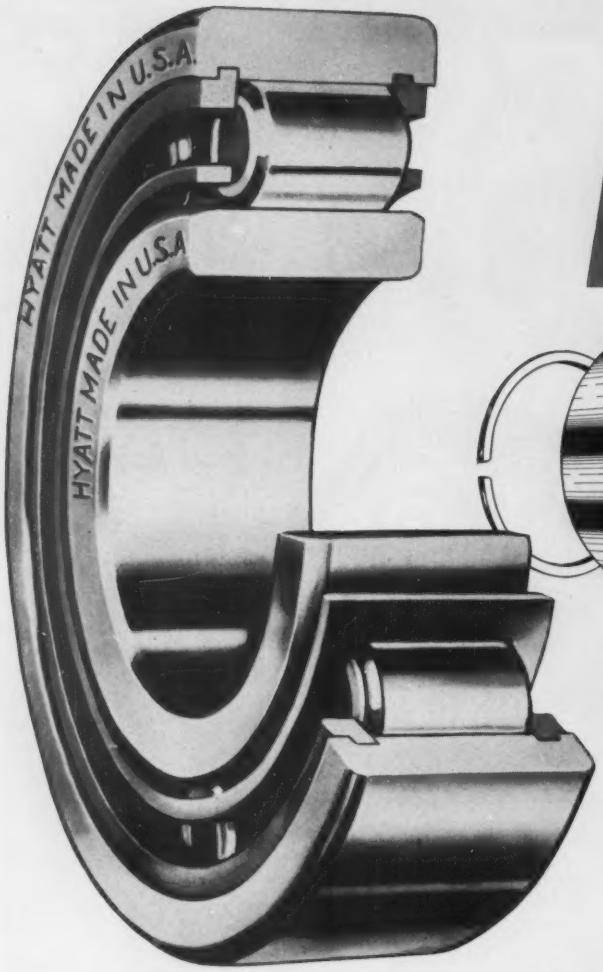
NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Plants also in Meriden, Connecticut, and Sandusky, Ohio
In Canada, McKinnon Industries, Ltd., St. Catharines, Ontario

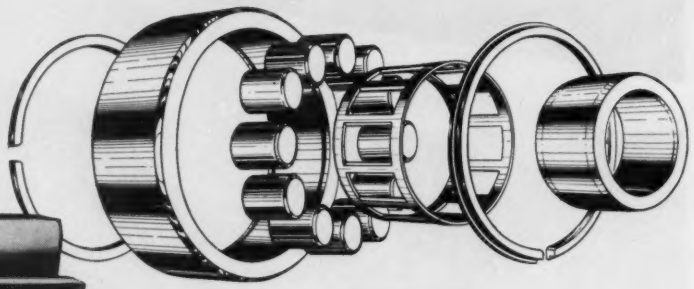
NEW DEPARTURE SALES ENGINEERING OFFICES—AT YOUR SERVICE

BRISTOL	269 North Main St.	2-6371	**DETROIT**	7-122 General Motors Bldg.	Trinity 2-4700	**KANSAS CITY**	1021 E. Linwood Blvd.	Valentine 4939
BOSTON	517-A Park Square Bldg.	Hancock 6-9867	**CINCINNATI**	2107 Carew Tower	Main 5783	**MILWAUKEE**	647 W. Virginia St.	Broadway 6-9460
KANNAPOLIS, N. C.	P. O. Box 1086	2-3181	**CLEVELAND**	3113 W. 110th St.	Winston 1-5454	**ST. LOUIS**	3001 Washington Blvd.	Franklin 6533
NEW YORK	1775 Broadway	Circle 6-1540	**INDIANAPOLIS**	1357 W. 18th St.	Imperial 4680	**LOS ANGELES**	5035 Gifford Ave.	Logan 8-2301
PHILADELPHIA	850 E. Luzerne St.	Garfield 3-4136	**PITTSBURGH**	Cathedral Mansions	Mayflower 1-8100	**BERKELEY**	1716 Fourth St.	Landscape 6-8750
SYRACUSE	2360 James St.	73-5195	**CHICAGO**	332 So. Mich. Ave.	Wabash 2-5875	**SEATTLE**	5000 First Ave., S.	Lander 5920
			DAVENPORT	2212 E. 12th St.	Davenport 7-7522			

For more information on products advertised, use Inquiry Card, page 243



A-TS



one of many Hyatt bearings offering capacity– separability– long life

The Hyatt A-TS Bearing is one of five basic Hy-Load types featuring a separable inner race.

Like all Hy-Loads, the A-TS is built with cylindrical rollers, so that it offers highest capacity for radial loads, plus the long, troublefree service assured by Hyatt's precision manufacture. But beyond that, this particular Hy-Load type offers the design advantages of interchangeable separable components.

With inner races removed, bearings of this type may be applied with rollers operating directly upon the surface of a suitably hardened shaft. This permits the use of larger-diameter shafts or smaller-size bearings, resulting in greater shaft rigidity or a saving in the cost of the bearing.

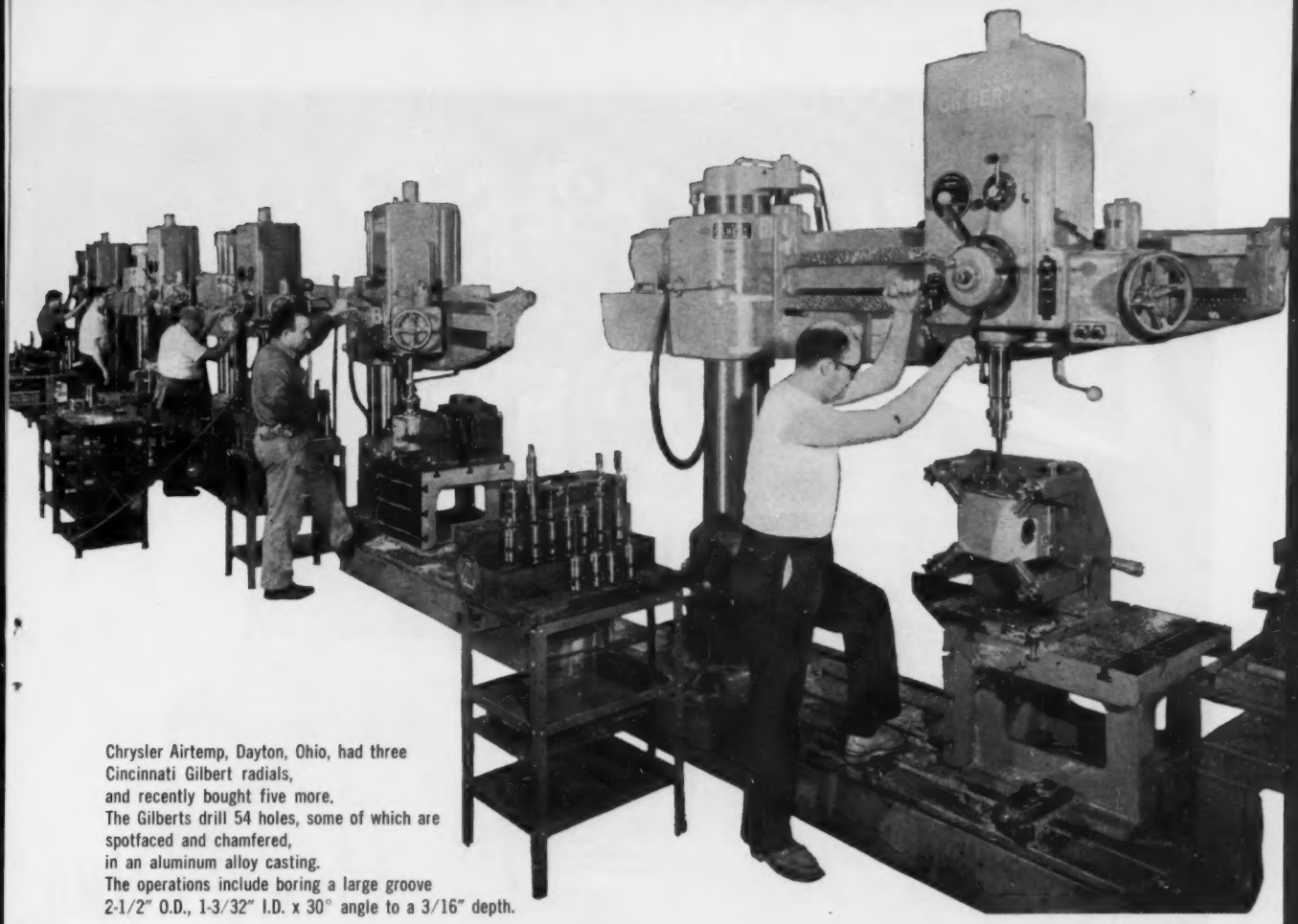
If you aren't already profiting through the use of Hyatt Hy-Load Bearings, contact a Hyatt sales-engineer or write today for our Catalog No. 150.

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

For more information on products advertised, use Inquiry Card, page 243



Chrysler Airtemp, Dayton, Ohio, had three
Cincinnati Gilbert radials,
and recently bought five more.
The Gilberts drill 54 holes, some of which are
spotfaced and chamfered,
in an aluminum alloy casting.
The operations include boring a large groove
2-1/2" O.D., 1-3/32" I.D. x 30° angle to a 3/16" depth.

They bought five more...

because Gilberts produce more. Ease of operation explains in part why Gilbert radials produce more in so many plants. For example, all speed and feed controls are on the head, within easy reach of the operator even when the arm is in its highest position. Direct reading speed and feed plates eliminate time-consuming calculations. You get instant finger-tip shifting of speed and feed levers. The four-lever feed turnstile puts one lever always within handy reach. Other easy-operating features: finger-tip clamping of the head to the arm; instantaneous one-lever arm control (unclamps, raises, or lowers the arm in one easy motion); effortless head traversing due to balanced, ball-bearing mounting; adjustable electric light at the spindle.

Gilbert radials have 9 or 11-inch columns; 12 spindle speeds in each of 3 ranges; 6 power feeds, .003" to .020". Tap leads are available. *Delivery in 30 days or less.* As the Chrysler Airtemp story shows, "those who buy Gilbert buy Gilbert again." Get full data on the Gilbert's many advantages.

Write for Bulletin 349 today.

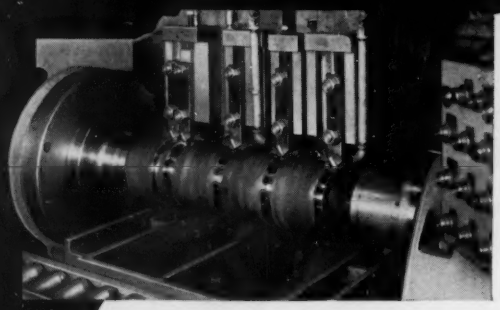
GILBERT

RADIALS • BORING MILLS • ACCESSORIES

THE CINCINNATI GILBERT MACHINE TOOL CO., 3366 BEEKMAN ST. • CINCINNATI 23, OHIO



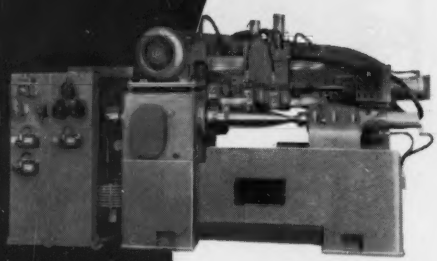
New HYDRA-FEED



52 lbs. of metal being removed per minute on one of the HD-16 Hydra-Feed lathes.

The HD-12

Like all other models, designed to J.I.C. standards. Note absence of tools in front of machine. Swing over top carriage is 14 inches on this model. Length between centers is 36 inches.

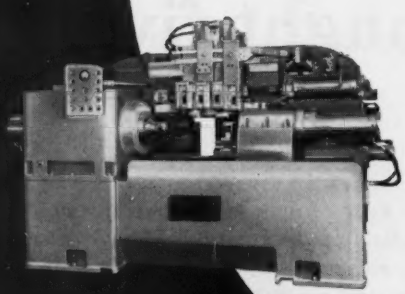


Announcing

the new high production pace setters

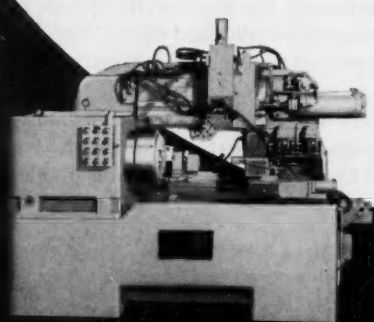
The HD-16

Chip disposal presents no problem on Hydra-Feeds. Big chutes have provision for chip conveyors. This model carries a 100 hp. motor. Length between centers is 48 inches; swing over top carriage is 17-inch diameter.

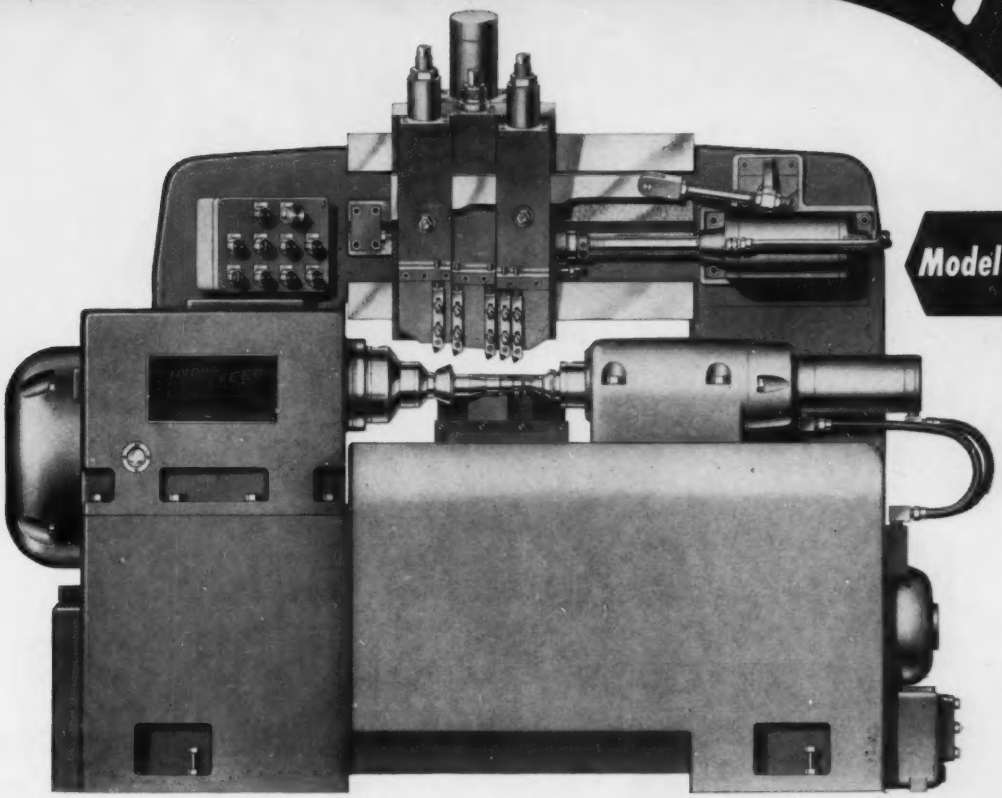


The HD-24

Chucking type model with platen slides (optional). Like all other Hydra-Feeds this machine has infinitely variable speed ranges through pick-off gears; longitudinal feeding rear and top carriages available.



AUTOMATIC LATHES!



Model HD-8

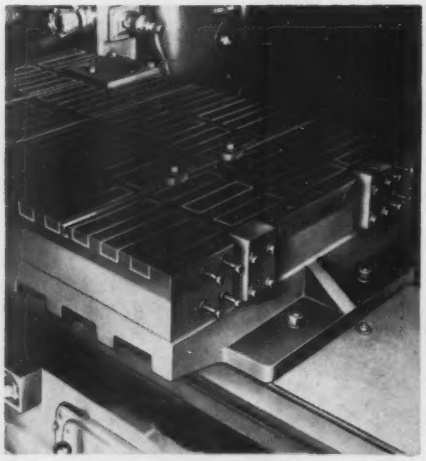
AUTOMATION?—Easy to apply. No obstruction.
CARBIDES?—Maximum carbide performance insured.
OUTPUT?—Maximum rates of metal removal.
CHIPS?—No problem. Automatic removal if desired.
MAINTENANCE?—Simple. J.I.C. throughout.
SMOOTHNESS?—Downward tool pressures plus massive design.

And every new feature of this remarkable new line of lathes has been thoroughly field tested in actual production over several years. *Ask for Catalog*

HYDRA-FEED MACHINE TOOL CORPORATION
SOUTH NORWALK, CONNECTICUT AND DETROIT (Ferndale), MICHIGAN
Address all inquiries to:
SALES AND ENGINEERING OFFICE, 730 W. EIGHT MILE ROAD, FERNDALE, MICHIGAN



Making Standard Chucks Do Special Jobs



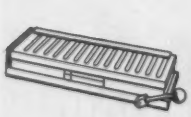
Tips from Taft-Peirce on Selecting Magnetic Chucks

Many times when a job requires an outsize magnetic chuck, an unusual shape, or a special setup . . . a combination of standard Superpower Chucks can be used to solve the problem. And at considerably lower cost. For instance, take the chuck on the machine above.

It's actually two standard 24″ x 48″ Superpower Chucks, placed end to end. This tandem arrangement provides a split in the middle, which operators find valuable for a reference point in setting up and machining work.

There are, of course, cases where standard chucks won't do. For example, the special 55½″ x 40″ Superpower Chuck, at left, was built to hold cast iron loomsides on a 75 HP milling machine — while three 18″ carbide cutters and two 4″ mills take ¼″ cuts simultaneously at 30″ per minute. Even a Superpower Chuck (which packs more power in less space) must be specially built to handle such a job.

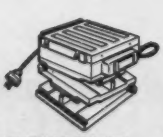
Perhaps you've got a chucking problem. Since we make both standard and special chucks we're impartial. We'd be glad to advise you which is best for your job. Just drop us a line, and ask for your copy of the Taft-Peirce Handbook, too.



PERMANENT MAGNET CHUCKS



RECTANGULAR ELECTRO-MAGNETIC CHUCKS



ADJUSTABLE ELECTRO-MAGNETIC CHUCKS



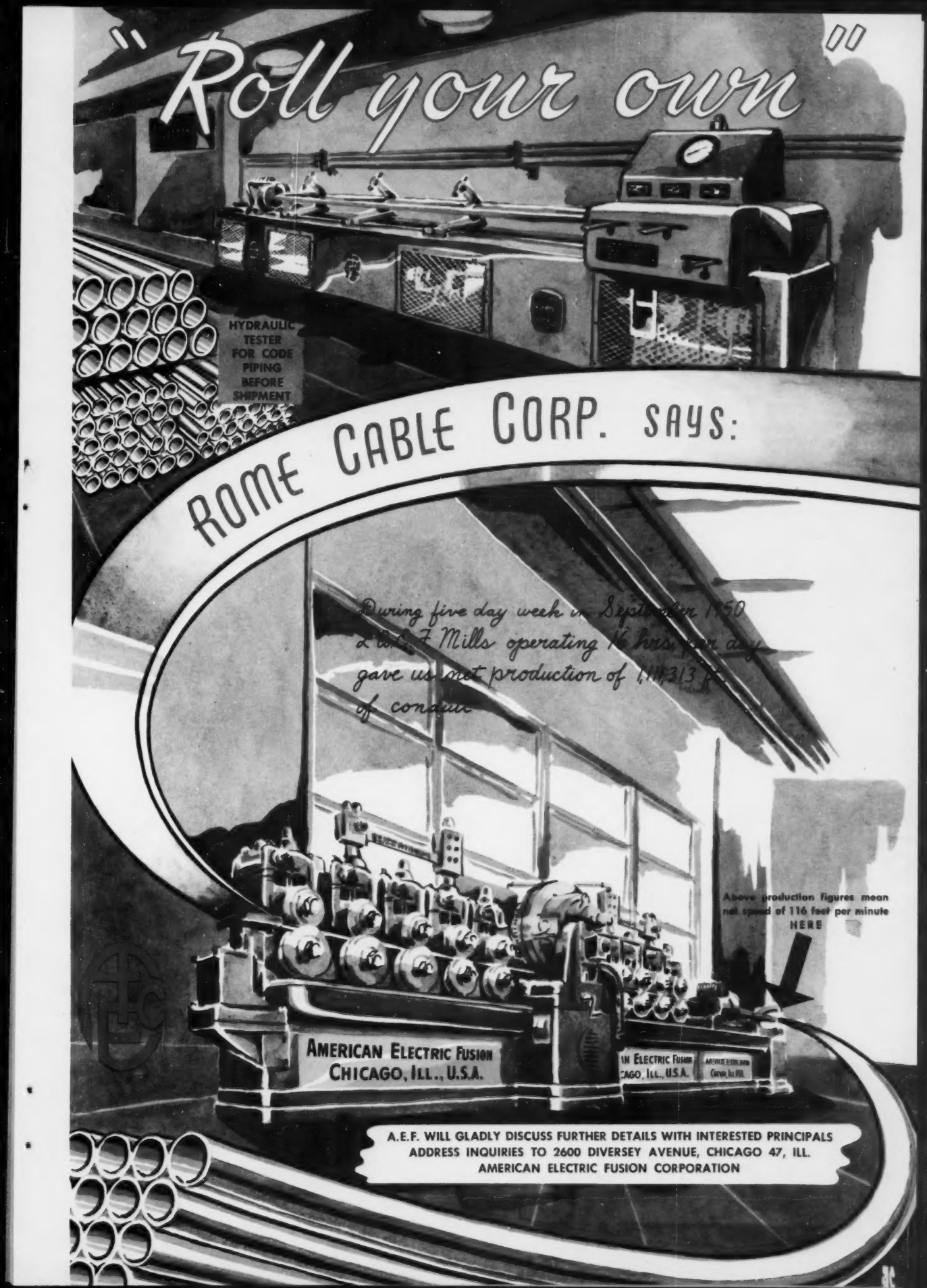
ROTARY ELECTRO-MAGNETIC CHUCKS

T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

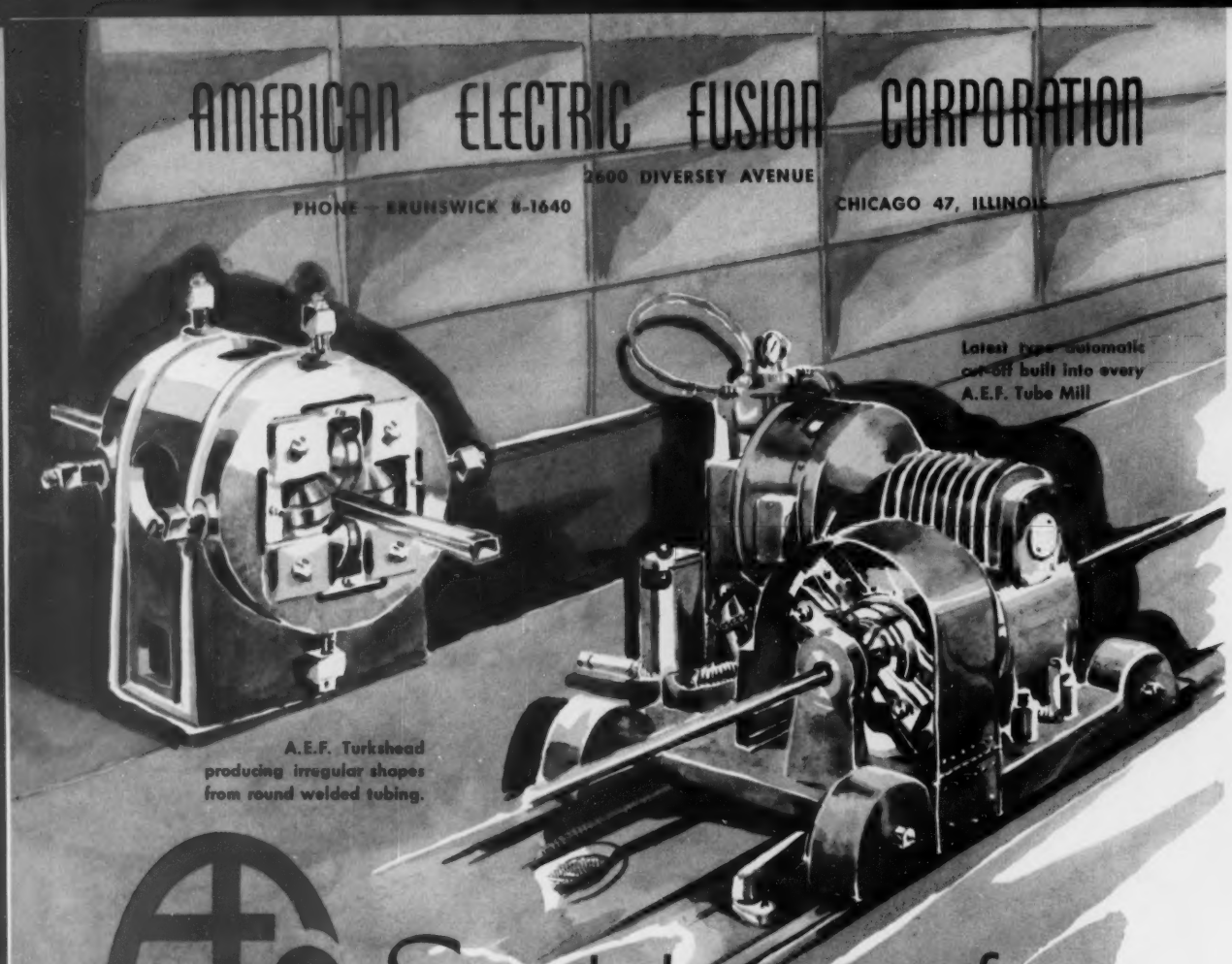
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"Roll your own"
HYDRAULIC TESTER FOR CODE PIPING BEFORE SHIPMENT
ROME CABLE CORP. SAYS:
During five day week in September 1950
gave us net production of 1,111,313 ft.
of conduit
Above production figures mean net speed of 116 feet per minute HERE
AMERICAN ELECTRIC FUSION
CHICAGO, ILL., U.S.A.
A.E.F. WILL GLADLY DISCUSS FURTHER DETAILS WITH INTERESTED PRINCIPALS
ADDRESS INQUIRIES TO 2600 DIVERSEY AVENUE, CHICAGO 47, ILL.
AMERICAN ELECTRIC FUSION CORPORATION

AMERICAN ELECTRIC FUSION CORPORATION

2600 DIVERSEY AVENUE

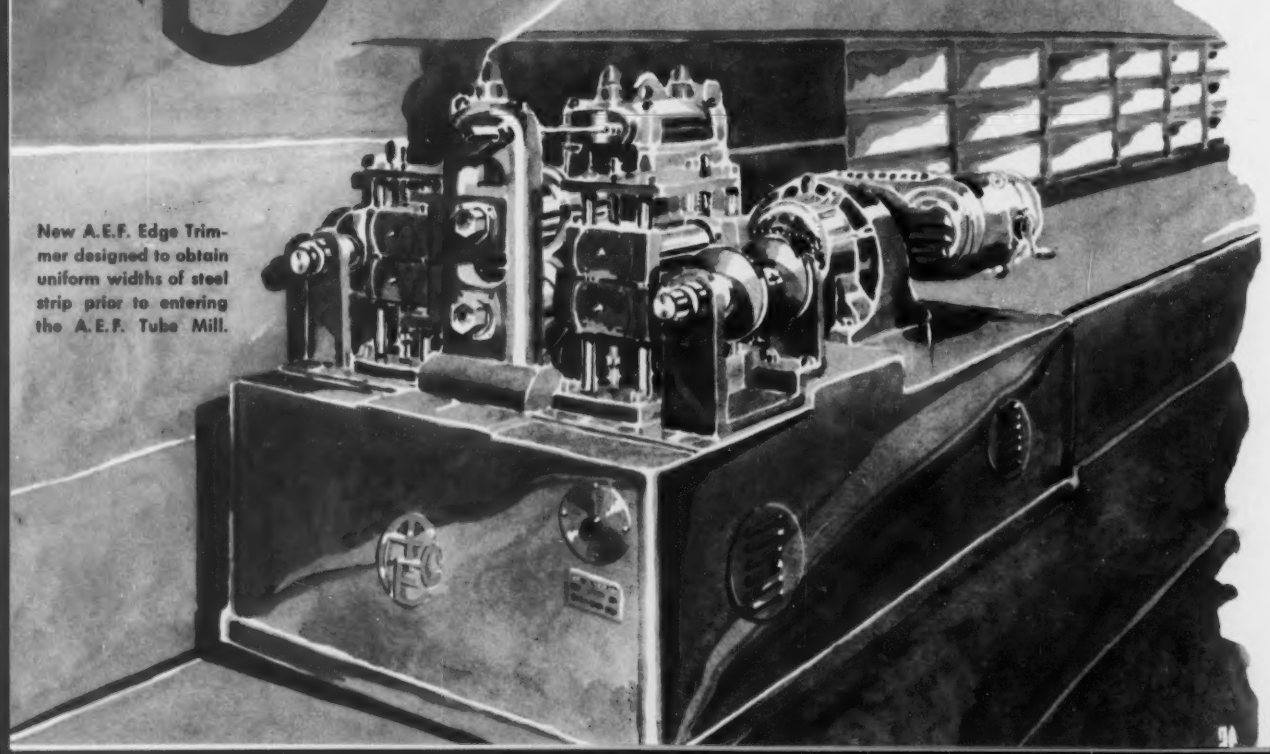
PHONE — BRUNSWICK 8-1640 CHICAGO 47, ILLINOIS



Latest type automatic cut-off built into every A.E.F. Tube Mill

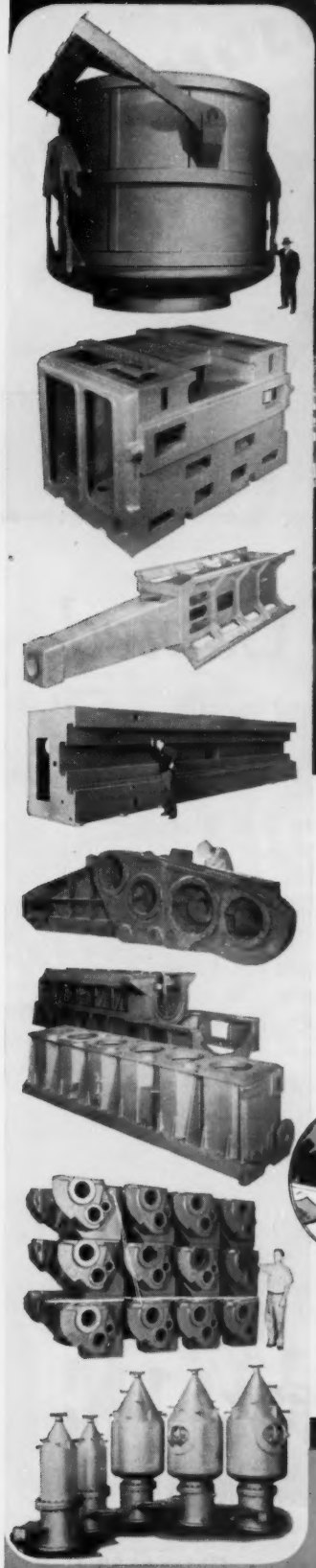
A.E.F. Turkshead producing irregular shapes from round welded tubing.

Sound design — first
Good appearance always



New A.E.F. Edge Trimmer designed to obtain uniform widths of steel strip prior to entering the A.E.F. Tube Mill.





Use WELDED STEEL for Greater Strength with Less Weight!

The 86-foot pressure vessel illustrated above is a Stabilizer built for a petroleum refining plant. This unit and its Overhead Receiver were Steel-Weld Fabricated by Mahon in accordance with the A.S.M.E. 1952 Code. Platforms, Ladders, and other miscellaneous iron, to complete this unit in the field, were also produced by Mahon. Equipment of this type, and the products, parts and assemblies shown at the left are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of processing plants and manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. Perhaps you, too, could profit by discussing this unique service with a Mahon engineer. If you require special equipment, or parts or assemblies including large, heavy pieces, where time and pattern costs are a consideration, Mahon Steel-Weld Fabrication may prove to be the answer. You can turn to Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to do the entire job from drawing board to finished machining. You will find in the Mahon organization a reliable source with ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight. See Mahon's Insert in Sweet's Product Design File, or have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON



. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS

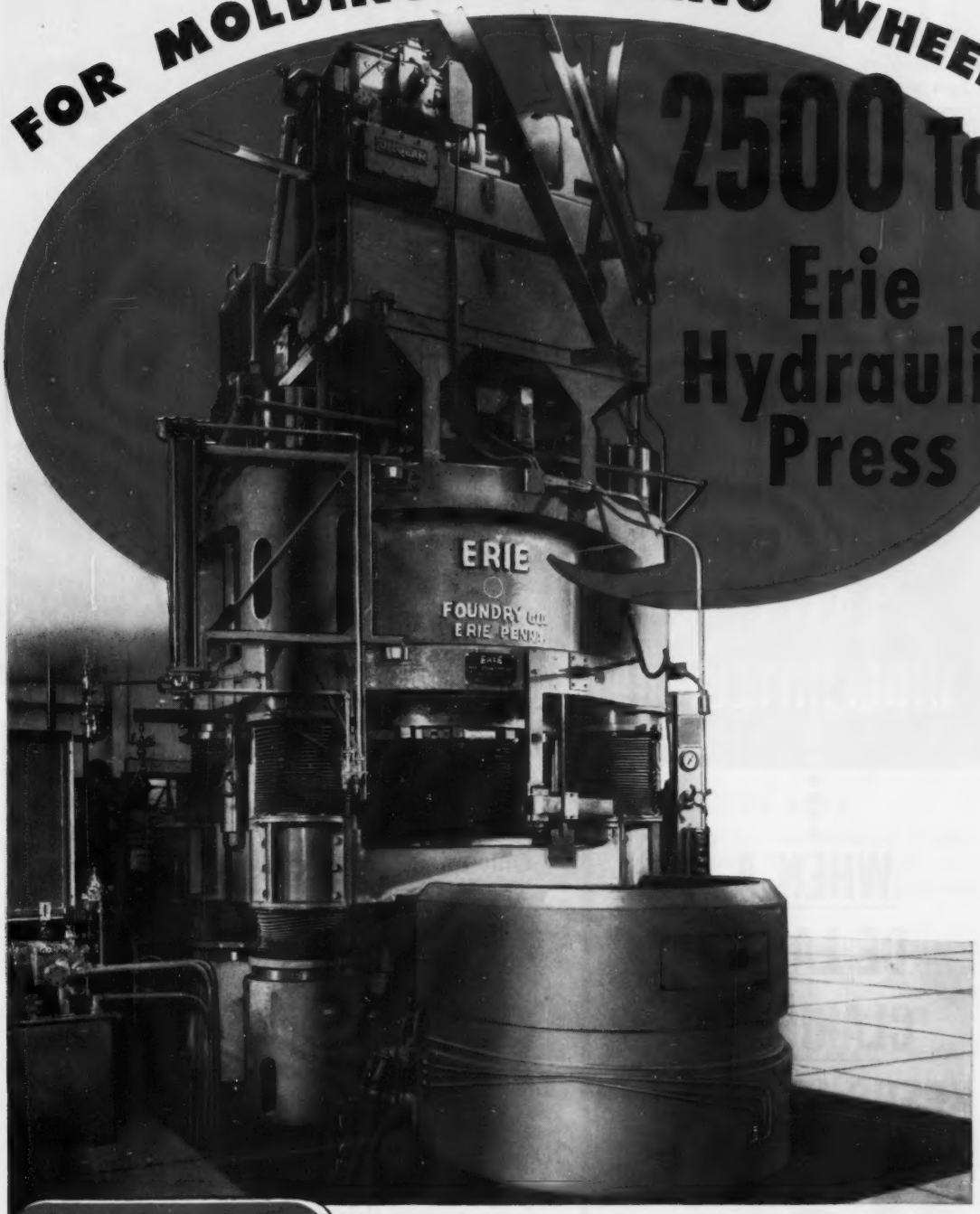
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • Chicago 39, U. S. A.

For more information on products advertised, use Inquiry Card, page 243

FOR MOLDING GRINDING WHEELS

2500 TON Erie Hydraulic Press



ERIE

TYPICAL of the hydraulic presses designed and built by Erie Foundry Company is this one in the plant of a leading manufacturer of grinding wheels.

OVER 50 years' experience in the manufacture of metal, rubber and plastic-forming presses is represented here. Consult with us on your hydraulic press requirements.

ERIE FOUNDRY COMPANY ERIE, PENNSYLVANIA

Dependable **HYDRAULIC PRESSES • FORGING HAMMERS**

These De Laval Coolant Clarifiers have been paying their way for more than a dozen years.



GRINDING COOLANT LASTS INDEFINITELY

WHEN A DE LAVAL CLARIFIER KEEPS IT CLEAN

With a De Laval "Hermetic"® Coolant Clarifier continuously removing the abrasive sediment there is practically no limit to the life of either oil or aqueous coolants. Only an occasional "make-up" is required. That's a big saving in itself.

But a De Laval "Hermetic" does a lot *more* than save coolant.

By preventing loading of the wheel, it (1) increases wheel life, (2) lengthens the period between dressings, (3) speeds up finishing operations, (4) gives finer finishes in less time.

As the result of these and other savings, De Laval "Hermetic" Coolant Clarifiers will pay for themselves in a short time.

The De Laval Coolant Clarification Bulletin covers this subject thoroughly and authoritatively. *Write for it.*

THE DE LAVAL SEPARATOR COMPANY

Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5

DE LAVAL PURIFIERS & CLARIFIERS FOR FACTORY OILS

For more information on products advertised, use Inquiry Card, page 243

DOWEL PINS



HOW TO USE THEM

1. Precision Dowel Pins are principally used where parts must be accurately positioned and held in absolute relation to one another whether stationary or in motion. They facilitate quick disassembly and completely accurate re-assembly.

2. Allen Dowel Pins are also used as plug gauges.

3. As plugs for determining angular dimensions of dovetail slides.

4. As hinge and wrist pins in applications requiring initial and permanent accuracy.

5. As accurate, economical roller bearings and axles.

6. As guide pins, stops and position locators.

HOW TO JUDGE THEM

1. *On precision, for low tolerance applications.* (Allen Dowel Pins are ground to a maximum microinch finish of 6 RMS protected by a rust preventive.)

2. *On strength, for shear resistance.* (Allen Dowel Pins are made from special Allenoy Steel, heat treated. Single shear strength measures from 160,000 to 180,000 psi.)

3. *On hardness of surface and a core hard enough to prevent "mushrooming" when driven into a tight hole.* (Allen Dowel Pins have a surface hardness of 62-64 Rockwell C Scale and core hardness of 52-54. Average case depth .010 to .020 depending on size.)

The simple sure way to be sure of uniformly superior dowel pin quality is the same as in buying precision socket screws — *get genuine Allens from your Industrial Distributor.* Only he sells them but *we will welcome your direct request for literature or application engineering assistance.*

ALLEN HEAD

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

Available in 108 Standard Sizes from ⅛" x ⅜" to 1" x 6". Standard tolerance .0002 oversize. Most sizes also standard in .001 oversize for repair work.

1933
1934

FLAT LAPPING OF METALS



A view of our experimental lapping laboratory. Note how Lapmaster in foreground provides complete accessibility for loading and unloading work. In 1953 we proved to more than 200 manufacturers that lapping was profitable and solved their problems.



Our lapping laboratory is also equipped with the finest checking instruments including surface analyzers, monochromatic lights and Sheffield and Swedish gauges to insure an accurate report of every experimental job.



How to find out if you need...

Precision Flatness, Finish and Parallelity in Production Quantities

and how to get it

Over 500 manufacturers of industrial equipment including pumps, compressors, valves and controls plus many of the largest automotive and aircraft plants have found production lapping a great time and money saver in their operations. In many cases gaskets between mating surfaces have been eliminated, while in others a closer tolerance has brought about a tremendous improvement in product performance. The extreme high production accuracy of the Lapmaster (Micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) have amazed and sold many production men. This accuracy has been definitely proven on practically all materials including cast iron, steel, stainless steel, aluminum, brass, carbon, ceramics, plastics and sintered metals.

Our Lapping Laboratory Is At Your Service

There is one sure way to find out if lapping is practical and profitable for you with no strings attached. We invite you to send us a few sample parts including surface finish specifications and approximate production requirements. The parts will be lapped in our laboratory shown above and returned to you with complete facts including data on number of finished parts per hour and recommended Lapmaster size to do the work. Many companies, large and small, have already taken advantage of this free service. In a majority of cases the Lapmaster has proven its use. Why not find out for *yourself* today.

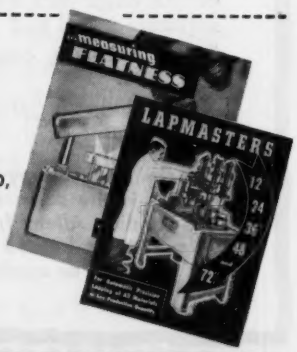
**Protected by U.S. and Foreign Patents*

Additional Data

on the Lapmaster is available on request, also new information on Measuring Flatness. Write for your copies today.

Crane Packing Company, Dept. M-10, 1833 Cuyler Ave., Chicago 13, Ill.

In Canada: Crane Packing Company, Ltd., 617 Parkdale Ave., North, Hamilton, Ont., Canada.

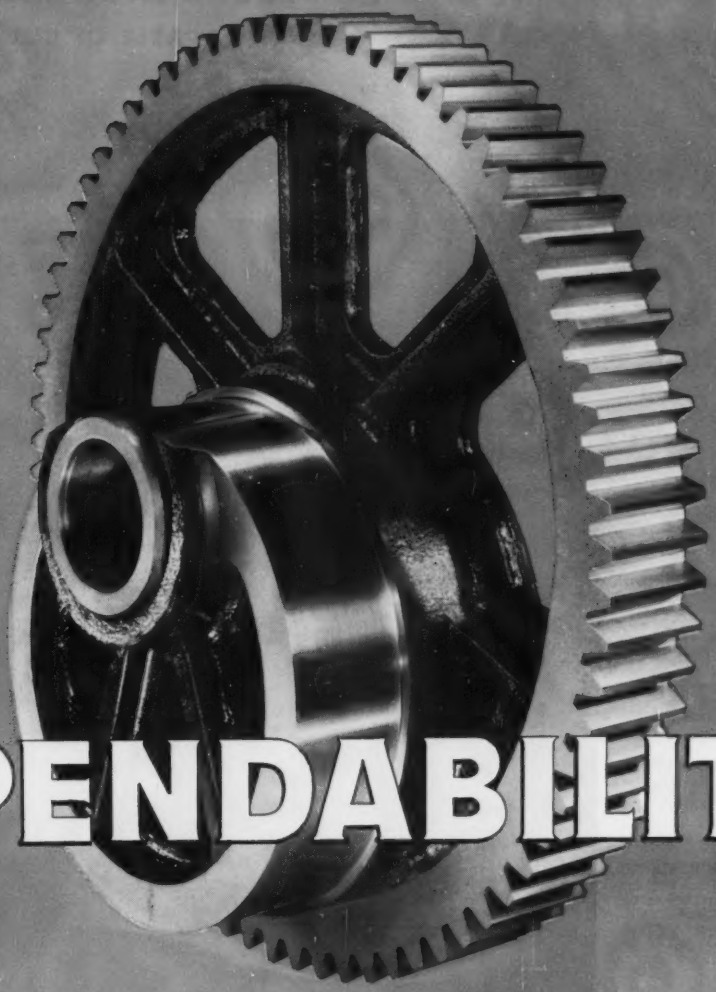


JOHN CRANE — CRANE PACKING COMPANY

For more information on products advertised, use Inquiry Card, page 243

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ILLINOIS GEARS...



DEPENDABILITY

proven by performance!

This gear—one of thousands like it that we have produced for the press industry—is a typical metal forming press bull gear. The first one we ever made was manufactured on our shop order No. 16672 dated July 25, 1933. This first gear, and the thousands that followed it, delivered a full, useful, and dependable life. They delivered *true economy*, the economy of long and dependable performance. They delivered complete customer satisfaction—proven by the constant repetition of orders from the builders of these giants of industries—metal forming presses.

There is never an argument or compromise with quality at Illinois Gear. You can write a purchase order for dependability—proven by performance. You, too, will get the finest gears that can be made— produced in the best equipped plants anywhere.

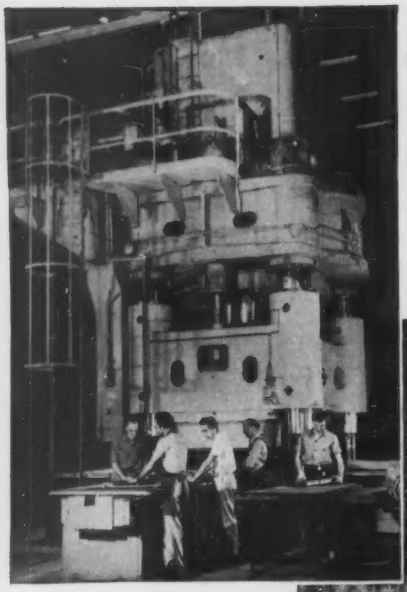
Look for this mark (ILL) *the symbol on finer gears*

ILLINOIS GEARS Reg U S Pat Off

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE • CHICAGO 35, ILLINOIS



BIRDSBORO HYDRAULIC PRESS

CAPABLE OF BOTH

Cold Pressing and Hot Forging



5000 Ton BIRDSBORO HYDRAULIC Press with rubber pad, forming airplane parts at Boeing Airplane Co., Wichita, Kansas.

5000 Ton BIRDSBORO HYDRAULIC Press forging parts for earth-moving equipment at R. G. LeTourneau, Inc., Longview, Texas.

● This 5,000 ton Birdsboro hydraulic press was originally designed for the *cold-forming* of airplane sheet metal parts. At present it is used for *hot-forging* tire frames of S.A.E. 1035 steel, axles and other parts for nationally famous earth-moving equipment. Here is unusual flexibility in press operation that proves the high efficiency and economy of Birdsboro hydraulic press design.

The press is single action with both push-button and sensitive manual controls. It is the open four-post type, arranged for rapid advance to the work. The press has a quick reverse, especially important in hot forging, by avoiding long contact of the hot metal with the dies, which reduces wear and tear of the dies.

Birdsboro hydraulic presses are made in many sizes and types. To apply this equipment to your needs, take advantage of Birdsboro's long experience and advanced engineering in this field.

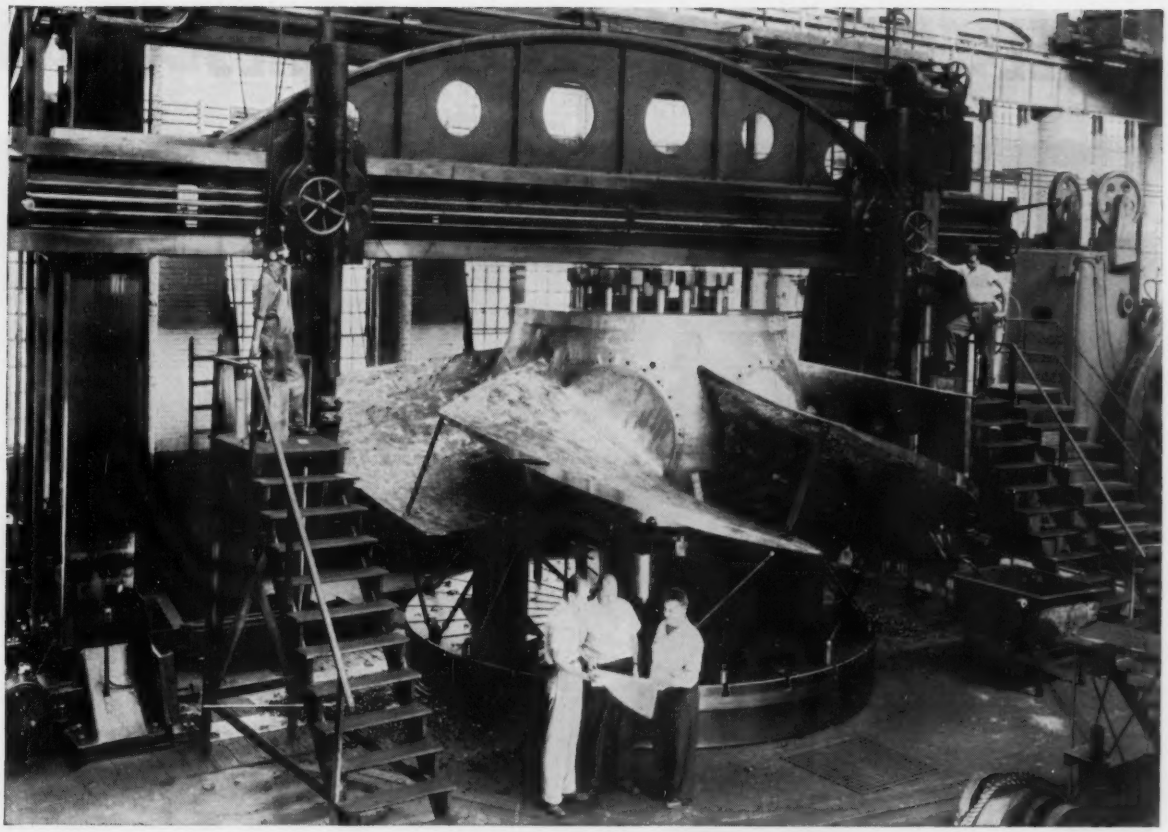
designed & built by **BIRDSBORO**

HP 8-51R

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. HYDRAULIC PRESSES Offices in Birdsboro, Pa. and Pittsburgh, Pa.

● ***designers and builders of:*** Hydraulic Presses • Steel Mill Machinery • Crushing Machinery • Rolls • Special Machinery • Steel Castings

For more information on products advertised, use Inquiry Card, page 243



Machining 165-ton carbon steel propeller runner, Grade 370 cut heavy scale at three times former speed, with 88% less downtime. Speed—154 SFPM. Feed—1/32 inch. Depth of Cut—7/16 inch.

From on-the-job reports

PRODUCTION INCREASES UP TO 30% WITH NEW CARBOLOY® SERIES 300 STEEL-CUTTING CARBIDES

Case histories, on these pages, prove Grades 350 and 370 outperform other carbides on tough steel-cutting jobs.

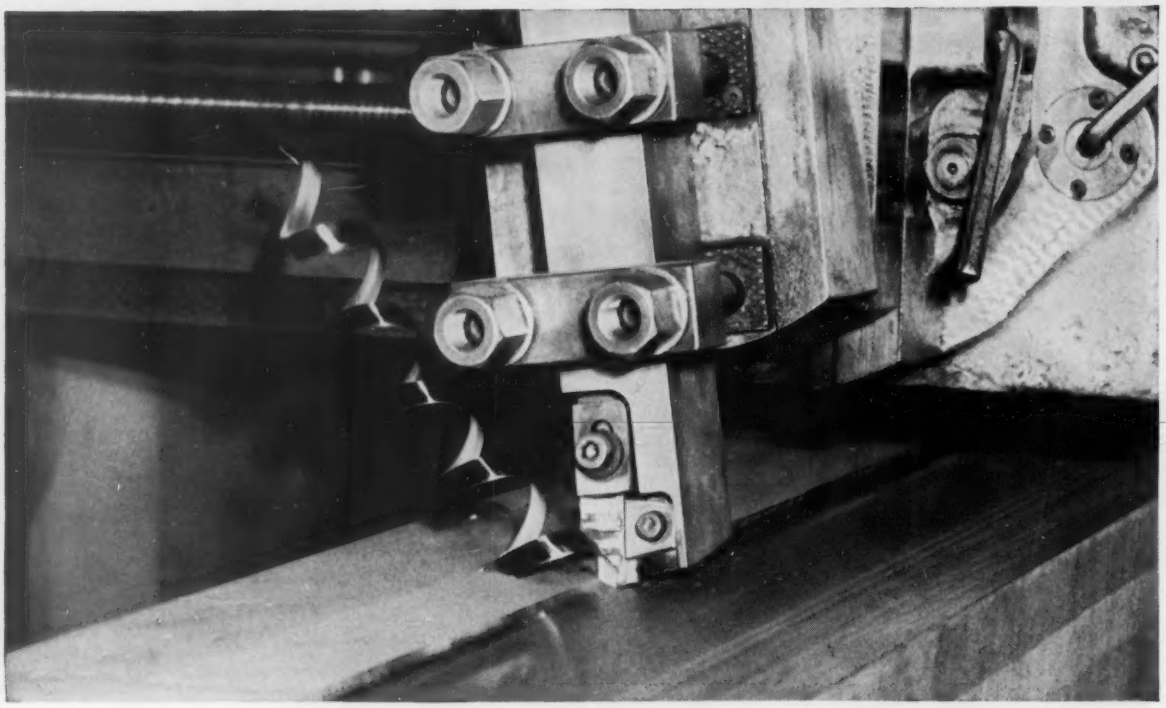
Carboloy Grades 350 and 370 are capable of cutting more cubic inches of steel per minute, with longer tool life, than any other carbides. This has been *proved* on in-the-plant applications, where these grades have boosted production as much as 30% over previous carbides used.

Grade 350 for medium-duty steel cutting, and Grade 370 for heavy-duty steel cutting, are the first of a new family of carbides manufactured by an entirely new process.

Both grades have a built-in structural rigidity that enables them to operate at temperatures as high as 1800°F without the tip deformation found in other carbides. They combine superior wear resistance and extreme toughness to a degree never before possible.

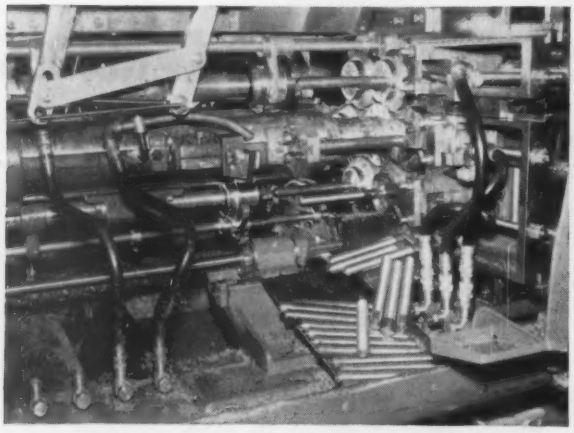
Case histories, operating data on following pages

STEEL-CUTTING CASE HISTORIES WITH



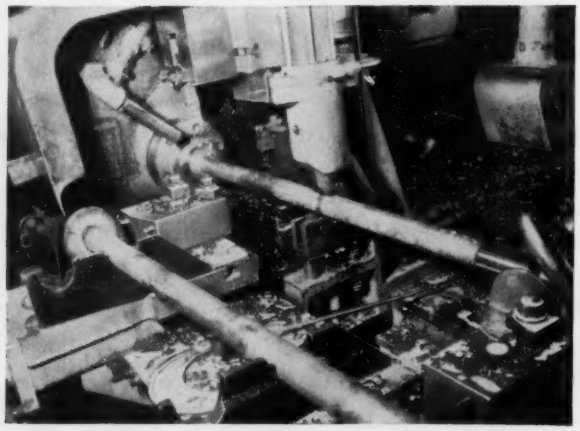
UNDERARM. A single Carboloy Grade 370 clamped-on tip planed all four sides of this normalized steel weldment at 300 surface feet per minute, without regrinding. Despite the large size (12″ x 14″ x 164″) wear on the carbide tip was only 0.010″.

SETUP: Material—1020 steel weldment, normalized. **Speed**—300 SFPM. **Feed**—0.060 inch per stroke for roughing; 0.080 inch per stroke for semifinishing. **Depth of cut**—⅜ inch for roughing; 0.030-0.040 inch for semifinishing. **Coolant**—No.



THREADED LEVELING SCREWS. Carboloy Grade 370 tools, used on 6-spindle Cone Automatic, boosted production to 944 screws per hour, compared to 140 with steel tools.

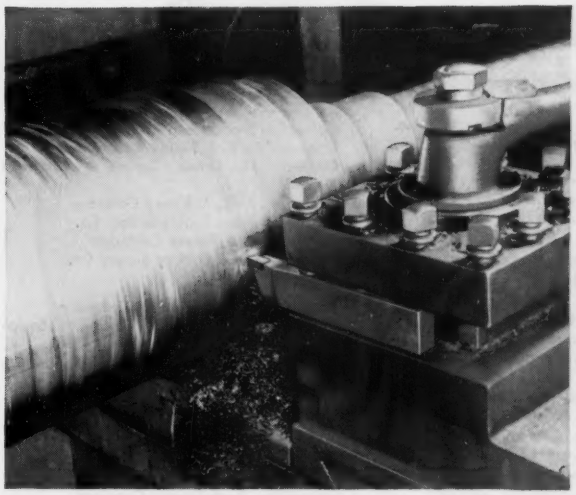
SETUP: Material—SAE B1112 1-inch diameter steel screw stock. **Speed**—1586 RPM for threading. **Feed**—0.005 inch for chamfering and cutoff. **Coolant**—Yes.



TRUCK AXLE FORGING. Turning with Grade 350 resulted in 33% more pieces per tool. Chipping and flaking, encountered with previously used tools, were eliminated.

SETUP: Material—AISI 4150 steel forging. **Speed**—200 SFPM on 2-inch diameter; 400 SFPM on 4-inch diameter. **Feed**—0.014 inch. **Depth of cut**—1/16-⅛ inch. **Coolant**—Yes.

NEW CARBOLOY GRADES 350 AND 370



ELECTRIC MOTOR SHAFT. Carboloy Grade 350 increases the number of linear inches cut by 30% over other carbides used for roughing and finishing this large steel motor shaft.

SETUP: Material—AISI 1045 modified (hot-rolled) with varying heat analysis. **Speed**—300 SFPM. **Feed**—0.020 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.



JET ENGINE TURBINE WHEEL RIMS. With Grade 370, G. E. got 300% increase in life of tools used for turning, boring and facing cold-worked Timken steel rims. Downtime was reduced two thirds.

SETUP: Material—Cold-worked, forged Timken steel. **Speed**—160 SFPM on O.D.; 110 SFPM on I.D. **Feed**—0.010 inch. **Depth of cut**—1/2 to 7/8 inch. **Coolant**—Yes.

Full stocks now available from Authorized Carboloy Distributors

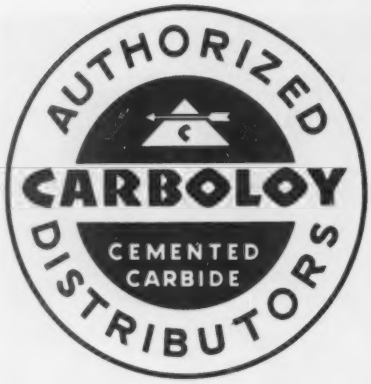
Standard Carboloy Tools are available in Grades 350 and 370. In addition, blanks and inserts of each grade are available in a wide range of styles and sizes.

Carbides for *any* machining job. Regardless of your particular machining problem, a grade of Carboloy cemented carbide is available to handle it. Over a quarter century of experience in machining ferrous and nonferrous, metallic and nonmetallic materials has been acquired by the Carboloy organization. See your Authorized Carboloy Distributor or Carboloy salesman for qualified, expert machining assistance.

Your local Authorized Carboloy Distributor is listed on the next page . . .

AUTHORIZED CARBOLOY DISTRIBUTORS

NATIONWIDE AVAILABILITY AND SERVICE



ALABAMA
Birmingham 2—The Young & Vann Supply Co.
Mobile—Oliver H. Van Horn Co., Inc.

ARIZONA
Phoenix—McConkey-Docker & Company

CALIFORNIA
Los Angeles 58—Garrett Supply Company
Los Angeles 58—Machinists' Tool & Supply Co.
Oakland 7—C. W. Marwedel
San Diego 1—Acme Tool & Supply
San Francisco 3—C. W. Marwedel
San Jose—Industrial Tool & Supply Co.

COLORADO
Denver 17—Mine & Smelter Supply Co.

CONNECTICUT
Bridgeport 1—The Hawley Hardware Co.
Hartford 1—Silliter-Holden, Inc.
Waterbury—The White Supply Company

FLORIDA
Jacksonville 1—The Cameron & Barkley Co.
Miami 5—The Cameron & Barkley Co.
Orlando—The Cameron & Barkley Co.
Tampa 1—The Cameron & Barkley Co.

GEORGIA
Atlanta 3—Pye-Barker Supply Company
Savannah—The Cameron & Barkley Co.

HAWAII
Honolulu 1—American Factors, Ltd.

ILLINOIS
Aurora—Dietz Industrial Supply
Chicago 6—Samuel Harris & Company
Chicago 7—Screw Machine Supply Co.
Chicago 6—Supplies, Inc.
Peoria 2—Couch & Heyle, Inc.
Rockford—Samuel Harris & Company
Rockford—Rockford Tool & Transmission Co.
Springfield—Screw Machine Supply Co.
Waukegan—Samuel Harris & Company

INDIANA
Fort Wayne 5—Tools & Abrasives, Inc.
Indianapolis 4—Tools & Supplies, Inc.
Indianapolis 9—Vonnegut Hardware Company
South Bend 24—South Bend Supply Company

IOWA
Davenport—Davenport Engineering Co.
Sioux City 10—Sioux Machinery & Supply Co.
Sioux City 1—Smith Electric and Supply Co.

KANSAS
Wichita—Ellfeldt Machinery & Supply Co.

KENTUCKY
Louisville 3—Louisville Mill Supply Co.

LOUISIANA
Baton Rouge—Oliver H. Van Horn Co., Inc.
New Orleans 6—Edgar Murray Supply Co., Inc.
New Orleans 1—Oliver H. Van Horn Co., Inc.
Shreveport—Harris Frederic & Co., Inc.
Shreveport—Oliver H. Van Horn Co., Inc.

MARYLAND
Baltimore 2—The L. A. Benson Co., Inc.
Baltimore 1—The W. L. Reynolds Co.

MASSACHUSETTS
Boston 15—Arthur A. Crafts Co., Inc.
West Springfield—Peaslee-Wells, Inc.
Worcester 8—Brierly, Lombard & Co., Inc.

MICHIGAN
Battle Creek—Kendall Hardware-Mill Supply Co.
Detroit 26—The Chas. A. Strelinger Company
Ferndale—Sterling Supply Company
Flint 2—Geo. W. Hubbard Hardware Co.
Grand Rapids 9—A. L. Holcomb Company
Jackson—C. E. Hamlin Company
Kalamazoo—Kendall Hardware-Mill Supply Co.
Lansing 29—Mill Supplies Corporation
Muskegon—Muskegon Hardware & Supply Co.
Port Huron—Beard Campbell Company
Saginaw—Mahar Tool Supply Co., Inc.

MINNESOTA
Minneapolis 1—The John C. Eide Co.
Minneapolis 4—The Satterlee Company

MISSISSIPPI
Jackson—Dilworth of Mississippi, Inc.

MISSOURI
Kansas City 6—Ellfeldt Machinery & Supply Co.
St. Louis 6—Sligo, Inc.
St. Louis 3—Tools & Supplies, Inc.

NEBRASKA
Omaha—The Balbach Company

NEW JERSEY
Kearney—A. N. Nelson, Inc.
Newark 2—Squier, Shilling & Skiff, Inc.
Trenton 8—Wiley-Hughes Supply Co., Inc.
Woodbridge—Hansen & Yorke Co., Inc. of New Jersey

NEW MEXICO
Albuquerque—Gorman Engineering Company

NEW YORK
Albany 1—Sager-Spuck Supply Co., Inc.
Binghamton—Syracuse Supply Company
Brooklyn 31—A. N. Nelson, Inc.
Buffalo 23—Austin Ford Logan, Inc.
Buffalo 2—R. C. Neal Company, Inc.
Elmira Heights—R. C. Neal Company, Inc.
New York 7—Hansen & Yorke Co., Inc.
Rochester 6—R. C. Neal Company, Inc.
Rochester—Syracuse Supply Company
Syracuse—Austin Ford Logan, Inc.
Syracuse 1—Syracuse Supply Company
Utica—Syracuse Supply Company

NORTH CAROLINA
Charlotte—The Henry Walke Co.
Winston-Salem—Atlas Supply Company

OHIO
Akron 4—Service Tool & Supply Company
Canton 1—Service Tool & Supply Company
Cincinnati 2—E. A. Kinsey Company
Cleveland 13—Strong, Carlisle & Hammond Co.
Columbus 13—E. A. Kinsey Company
Dayton—Dayton Supply & Tool Co.
Dayton 2—E. A. Kinsey Company
Toledo 1—Mill & Factory Supply Co.

OKLAHOMA
Duncan—Duncan Equipment Company
Oklahoma City—Marshall Supply & Equipment Co.
Tulsa 1—Marshall Supply & Equipment Co.

OREGON
Portland 4—J. E. Haseltine & Company

PENNSYLVANIA
Allentown—Wm. H. Taylor & Co., Inc.
Erie—Erie Mfg. & Supply Corp.
Harrisburg—Raub Supply Company
Lancaster—Raub Supply Company
Philadelphia 7—Alden Supply Company
Philadelphia 25—Theo. C. Ulmer, Inc.
Pittsburgh 3—Harris Pump & Supply Company
Reading—Seaman Mill Supplies, Inc.
Scranton 2—The Bittenbender Company
Williamsport 34—Lowery Electric Company, Inc.
York—W. S. Ehrenfeld Co.

RHODE ISLAND
Providence 1—Providence Mill Supply Co.

SOUTH CAROLINA
Charleston—The Cameron & Barkley Co.
Greenville—Poe Hardware & Supply Co.

TENNESSEE
Chattanooga—Mills & Lupton Supply Co.
Knoxville 1—W. S. Murrian Company
Memphis 2—J. E. Dilworth Company

TEXAS
Dallas 4—Briggs-Weaver Machinery Co.
Dallas 1—Tool Supply & Engineering Co.
El Paso—El Paso Saw & Belting Supply Co.
Fort Worth—Briggs-Weaver Machinery Co.
Fort Worth 1—Oliver H. Van Horn Co., Inc.
Houston 11—Briggs-Weaver Machinery Co.
Houston 11—A. J. Rod Company, Inc.
Houston—Oliver H. Van Horn Co., Inc.

UTAH
Salt Lake City 1—Mine & Smelter Supply Co.

VIRGINIA
Norfolk 1—Empire Machinery & Supply Corp.
Norfolk 10—The Henry Walke Co.
Richmond 15—Industrial Supply Corp.

WASHINGTON
Seattle 4—J. E. Haseltine & Company
Spokane 11—J. E. Haseltine & Company

WISCONSIN
Milwaukee 1—Rickert Industrial Supply Co.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11147 East 8 Mile Ave., Detroit 32, Michigan

For more information on products advertised, use Inquiry Card, page 243



The precise pitch of this wire helix, in its glass tube, is accurately measured by Hewlett-Packard Company, using a Kodak Contour Projector.

to make the difficult easy

...the easy economical



Using the same contour projector, Hewlett-Packard checks spacing and parallelism of this special tuning condenser.

Hewlett-Packard relies on the Kodak Contour Projector

Here is an on-the-job demonstration of how projection gaging can solve difficult problems in inspection, slash costs in checking parts to close tolerances.

Using a Kodak Contour Projector, Hewlett-Packard Company measures the pitch of a precision wire helix for a unique electronic tube. Surface and shadow illumination provide a 20× enlarged image of the minute and delicate part. "Without the Kodak Contour Projector," say Hewlett-Packard officials, "it would not be practical to make the measurements necessary to get a satisfactory instrument."



Using the same contour projector, Hewlett-Packard also checks spacing and parallelism of a special tuning condenser for electronic test equipment. Conventional shadow projection provides a 10× enlarged image of the leaves. "Use of the projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

Diverse jobs like this are easily done with a Kodak Contour Projector. A twist of a dial provides whatever magnification is needed. A flick of a switch brings surface illumination to supplement shadow projection. Easy to see, isn't it, how a Kodak Contour Projector quickly pays for itself in use.

For more information on how you can use projection gaging in your own work, send for a free copy of "Kodak Contour Projectors."

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES
See Discs, Abrasive

ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.



DESIGN



Send for This Handy Bulletin



Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

Engineered to deliver maximum torque — with minimum size — ROCKFORD CLUTCHES provide abundant brawn, without unnecessary bulk. Spring-loaded and over-center, single or double-plate, or multiple-disc types fit compactly into product designs. If your project calls for a drive that *must* fit neatly into limited space, consult ROCKFORD clutch engineers — while your size problem still is on the drawing board.

ROCKFORD CLUTCH DIVISION
BORG-WARNER
410 Catherine Street, Rockford, Illinois

ROCKFORD CLUTCHES

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Greer Hydraulics, Inc., 454—18th St., Brooklyn 15, N. Y.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburg, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc
New Jersey Zinc Co., 160 Front St., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

ARBORS AND MANDRELS
Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.

(*Continued on page* 290)

For more information on products advertised, use Inquiry Card, page 243

OSBORN

From 50 minutes to 6. Burr removal and finishing of rack gears was formerly a 50-minute job by hand. Now, with the machine shown and Osborn Fascut® Brushes, the job takes only 6 minutes. Smoothness and uniformity are far superior.



8 times as fast!

What could this study do for you?

THE burr-removal and finishing job shown above formerly took 50 minutes. Now, with Osborn Power Brushing, it takes only 6 minutes and the product is far superior. Helping to get results like this is the big objective of Osborn Brushing Specialists when they make an **O**sborn **B**rushing **A**nalysis.

It will pay *you* to have an **OBA** made of your production cleaning and finishing operations to find out definitely where the latest power brushing techniques can improve quality and cut your costs. Call or write *The Osborn Manufacturing Company, Dept. D-22, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



How he works. In making an **OBA**, your nearby Osborn Brushing Specialist studies your production with an eye to improving cleaning and finishing operations with power brushing. He gives you a written report with recommendations. His extensive experience is backed up by the facilities of the Osborn Technical Department.

Osborn Brushing Analysis

TO HELP YOU DISCOVER HIGHER QUALITY AND LOWER COSTS WITH POWER BRUSHING

HE has it...



the information you want!

YOUR industrial distributor can tell you many ways in which you can save money by using Bunting Bronze Bearings and Bars and the other material and equipment items he sells.

He has selected each of the countless things in his stocks after careful study and comparison, seeking those which will do the most for you.

YOUR BUNTING distributor is the leading industrial distributor, or a stock-carrying specialist in certain industrial items. With money-saving convenience, he can supply hundreds of different sizes of completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars.



Ask him for a Bunting Catalog which gives complete dimensional and technical data.

Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

The Bunting Brass & Bronze Company • Toledo 1, Ohio
Branches in Principal Cities • Distributors Everywhere

Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Casa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Machine Co., Philadelphia, Pa.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.

BALLS

Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

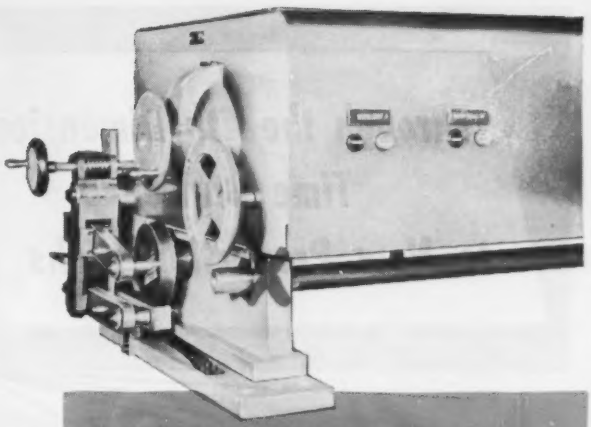
BEARINGS, Ball

Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Torrington Co., Torrington, Conn.

(*Continued on page* 292)

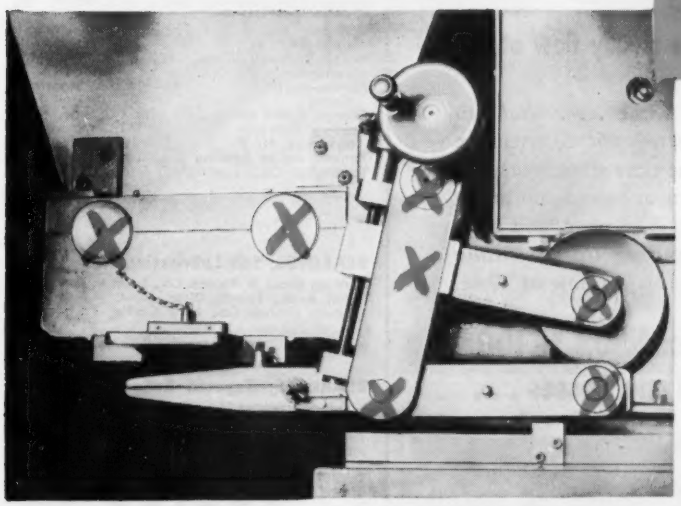
For more information on products advertised, use Inquiry Card, page 243

"X" marks the spots



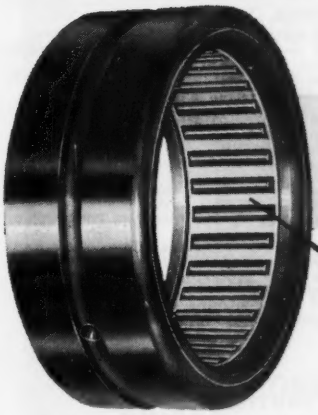
where Weidenmiller Cookie Cutters "gained close precision and eliminated roller skewing" by installing

ORANGE *Cage Type* NEEDLE BEARINGS



"Very fine service — trouble-free!"

—reports Edw. Weidenmiller Co., Inc., Morton Grove, Ill., after about 2 years' experience with Orange Cage Type Needle Bearings in their wire cut machines used for cutting cookies on 32″ and 38″ continuous baking ovens. In all, 20 bearings are used in the feed rolls, drive shafts and all mechanical wire cut mechanism parts. Closeup view at left shows unusual combination of operating conditions met by bearings, due to design requirements.



True running in any position
... vertical, tilted, horizontal or overhung applications

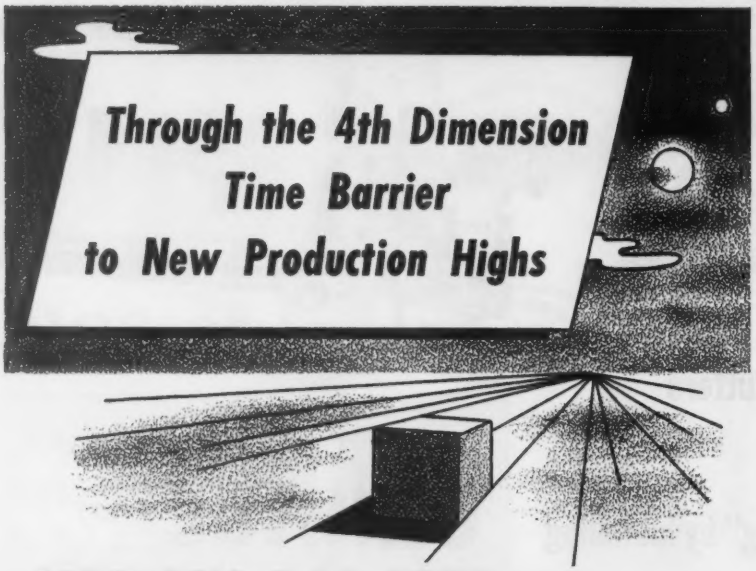
ORANGE Cage Design assures alignment of rollers—prevents skewing

Note that square-end rollers are held in alignment by pockets of a free-floating, land-riding cage made of anti-friction, non-ferrous metal. This cage merely guides—does not wear on rollers.



This feature has placed Orange Cage Type Needle Bearings in many applications hitherto unsuited to conventional types—providing high load capacity in small space, with exceptionally smooth, quiet, trouble-free operation under practically every type of running condition. Stock sizes from ½″ to 8″ shaft dia., fully interchangeable with standard heavy-duty needle bearings. Write for Engineering Data Folder.

ORANGE ROLLER BEARING CO., Inc. 552 Main St., Orange, N. J.



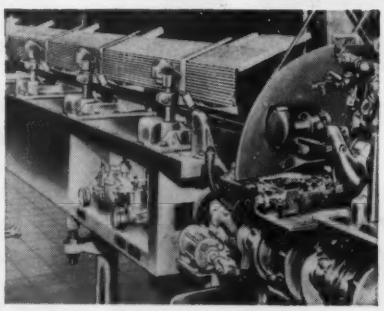
LIPE AML BAR FEED

gears machine production to the steady flow of Time

ALL industrial results are achieved in Time . . . *vital 4th dimension that measures output, costs, profit.* Shorten the time gap between operations . . . shorten the time when machines are "cutting air" . . . keep machines producing at a steady optimum rate during the fatigue slow-down from 10:30 to noon, and from 3 P.M., till closing time . . . *and you are getting 4th Dimension production.* Production that is geared to the steady flow of Time.

Lipe AML Bar Feed Produces from 30% to 100% More Output by Eliminating Time Losses . . .

Time losses account for the enormous differences in output among workmen. By eliminating these losses automatically, the Lipe AML Bar Feed boosts overall production from 30% to 100%. That's because stock is fed to the machine independent of the operator. Constant pressure behind the stock assures uniform speed of feed. No feed fingers to fail or mar stock. No multiple feed-outs, even on the longest pieces.



Mail the coupon now for free literature giving full details on the Lipe AML Bar Feed.

LIPE ROLLWAY

LIPE ROLLWAY CORPORATION
Syracuse 4, N. Y.

Sure, I'd like to know more about the Lipe AML Bar Feed. Send me your free booklet.

Name_____ Title_____

Company_____

Street_____

P.O._____ Zone_____ State_____

BEARINGS, Bronze and Special Alloy
Bunting Brass & Bronze Co., Spencer & Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT SHIFTERS
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, TRANSMISSION
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

(*Continued on page* 294)

For more information on products advertised, use Inquiry Card, page 243



At the '54 Metal Exposition—Nov. 1-5 . . .

50,000-PLUS METALS INDUSTRIES MEN

WILL LEARN NEW WAYS OF CUTTING COSTS!

Your competitors . . . thousands of 'em . . . will be on hand at this great industrial event to check closely on everything that's new and improved . . . everything that will help them build better products . . . cheaper . . . faster!

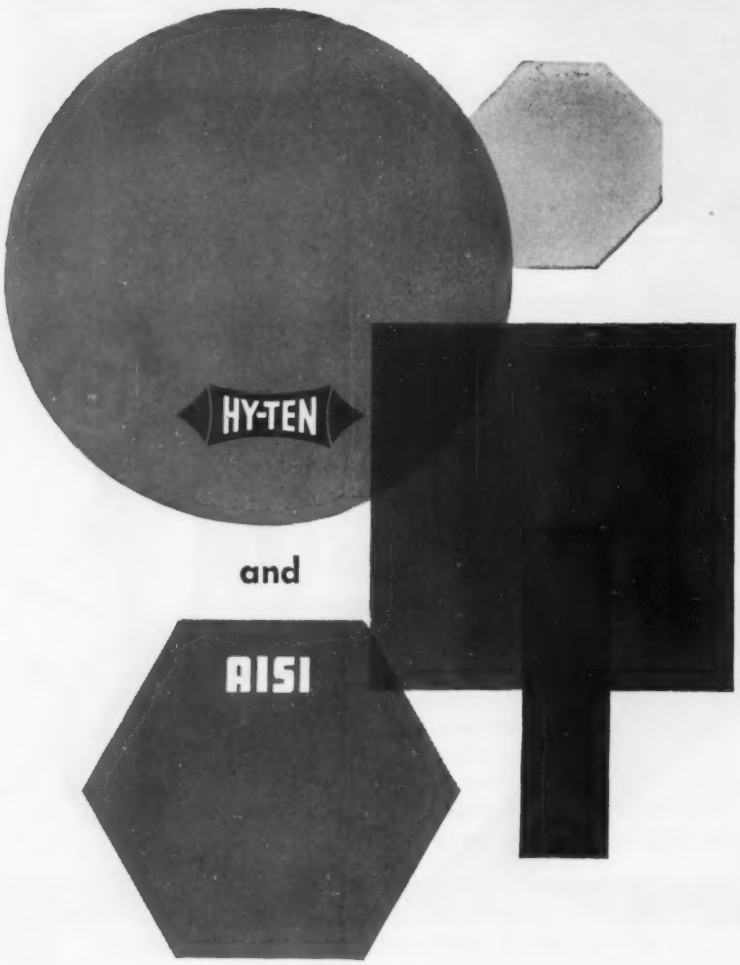
They'll come from all corners of the land . . . these 50,000-plus metals industries men . . . and they'll take away with them, when this great Metal Show ends, more ideas . . . more information and more know-how than any 'stay-at-home' executive could possibly match!

Owned and Managed by
AMERICAN SOCIETY FOR METALS
W. H. Eisenman, *Managing Director*
Chester L. Wells, *Ass't. Director*

INTERNATIONAL AMPHITHEATRE
CHICAGO NOV. 1-5

NATIONAL METAL EXPOSITION

NATIONAL METAL CONGRESS



bars, billets and forgings in sizes, shapes and treatments for every need!

Wheelock, Lovejoy & Company, Inc., can fill your alloy steel requirements promptly. This applies to both standard AISI and SAE steels and to our own HY-TEN steels—"the standard steels of tomorrow". Take advantage of our seven strategically located warehouses. All of them can supply these steels in the form and quantity you need. Every warehouse, too, is staffed with expert metallurgists who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

near you . . .

Warehouse Service—Cambridge • Cleveland • Chicago
Hillside, N. J. • Detroit • Buffalo • Cincinnati
In Canada—Sanderson-Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.
138 Sidney Street, Cambridge 39, Mass.

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BENDING MACHINES, Pipe
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

BLUING LAYOUT
Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

(*Continued on page 296*)

For more information on products advertised, use Inquiry Card, page 243

PETERMANN

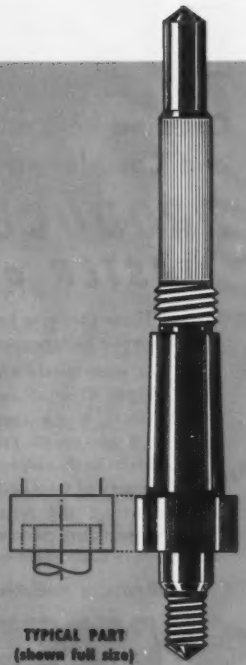
AUTOMATICS



for close tolerances . . .

THIS NEWEST MEMBER OF THE *Petermann* FAMILY OFFERS NEW AND VALUABLE FEATURES SUCH AS:

1. Six (6) radial tools (all independently controlled).
2. Hydraulic buffer for shortening the time of return stroke.
3. Accelerator which speeds up the cam shaft during "idle time"
4. Speed box change for both spindle and cam shaft.
5. Automatic lubricating system.



TYPICAL PART (shown full size) PRODUCED ON A PETERMANN AUTOMATIC

Complete tooling service and parts in America

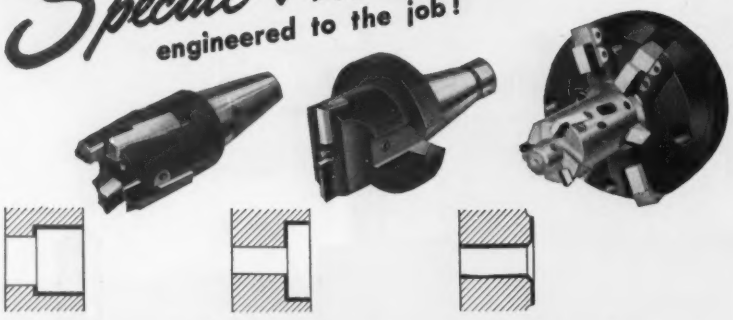
RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

McCROSKY

1904-1954 COST CUTTING TOOLS 50TH ANNIVERSARY

Special Production Tools
engineered to the job!



Combine Related Boring, Counter-Boring, Facing, and Chamfering Operations Into Just One Tool

PRODUCE BETTER WORK FASTER and at LOWER COST

● How can you keep competitive if you do four operations, when your competitor does only one?

Cut your costs and increase your output with McCrosky's "Multiple Operation" specials. Engineered specially to your individual work conditions, a McCrosky Special combines 3, 4, 5 or more related operations — does them all simultaneously with one tool — and one set-up — assuring unvarying uniformity of finished product — eliminating repeated handling — reducing the amount of work in process — speeding up deliveries and producing other economies so great that they pay their way even on moderately short runs.

Write for Bulletin No. S-18. It can really save you money!

COST CUTTING TOOLS McCROSKY TOOL CORPORATION MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

Jack-Lock® MILLING CUTTERS	3" to 24" in diameter.
Universal MILLING CUTTERS	Up to four times as many blades as the cutter diameter.
Super® Adjustable REAMERS	15/16" to 6" in diameter.
Wizard® QUICK CHANGE CHUCKS	Change drilling tools without stopping the spindle.
Turret TOOL POSTS	Gives engine lathes the versatility of turret lathes.
Block Type BORING BARS	Centering V-key locks cutter block accurately and rigidly
Multiple Operation TOOLS	Combine related operations speeding production and cutting costs.

BOOKS, Technical
Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING AND TURNING MILLS, Vertical
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

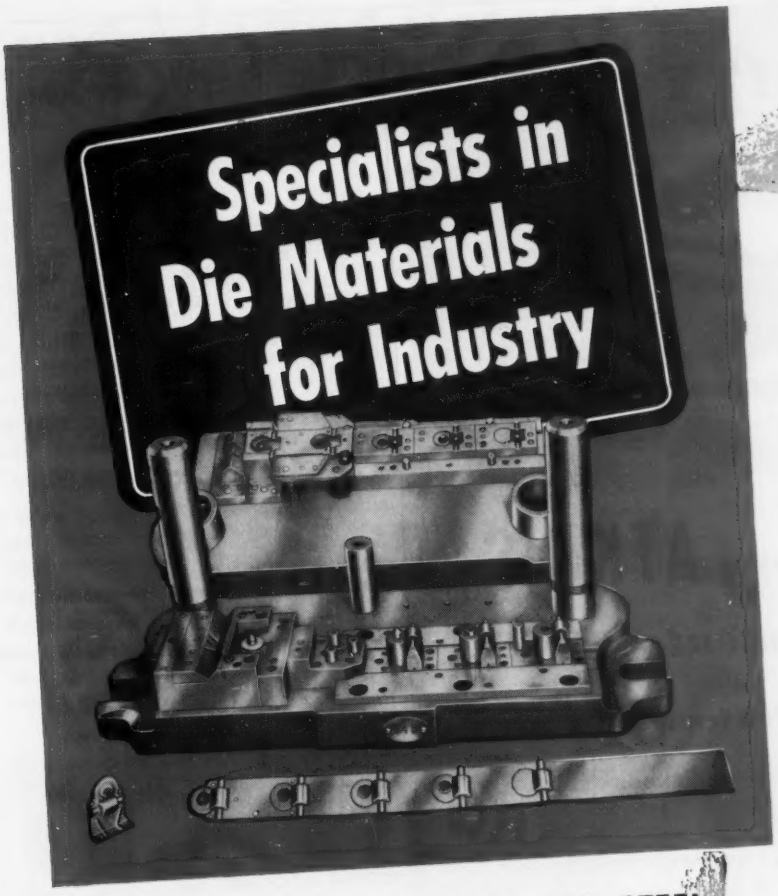
BORING, DRILLING AND MILLING MACHINES, Horizontal
(Floor, Planer or Table Types)
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5 Ind.

(*Continued on page* 298)

For more information on products advertised, use Inquiry Card, page 243

VISIT OUR EXHIBIT

SPACE NO. 315, METAL SHOW



A COMPLETE LINE...CARBIDE AND STEEL

●Firth Sterling offers manufacturers and fabricators the advantages of a *single* source of supply of materials for both tungsten carbide and steel shaping, forming, piercing, heading and other dies. This *complete* line, from famous Firthaloy, for maximum performance where carbide is a requirement, through almost one hundred grades of high speed and tool steels for cut-off knives, roll guides, die casings, forming rolls and similar applications, provides the exactly right material for each application. Maximum production at lowest cost is thus assured.

Standard items are available from warehouse stocks; others may be obtained from your local tool and diemaker.

Firth Sterling representatives are skilled in interpreting the needs of industry and in suggesting the exactly right steel or carbide for specific applications. Because they know and sell both, you can depend on their unbiased recommendations to result in better, more economical tooling.

Attention: Fastener Industry! C.H.Q. Die Steel makes cold heading records



C.H.Q. solid die after 192,000 run.

A nationally known fastener manufacturer* recently made comparative tests of solid steel cold heading dies, under carefully controlled conditions, producing ⅝" square head machine bolts from 1020 steel on a Waterbury Farrel double stroke automatic.

Firth Sterling C.H.Q. came off with top honors and the highest production ever obtained by this manufacturer from any steel die . . . 192,045 both ends. (78,860 one end, 59 Rockwell C; 113,185 other end, 61 Rockwell C.) Standard competitive carbon steel dies produced only 50,000-60,000 both ends and ultimately failed by cracking axially. The C.H.Q. die wore oversize but longitudinally etched section revealed not even a hairline crack.

Ask for technical literature on C.H.Q.—or a Firth Sterling representative will discuss your die problems.

*(name on request)

R-292-A

Firth Sterling

—INC—

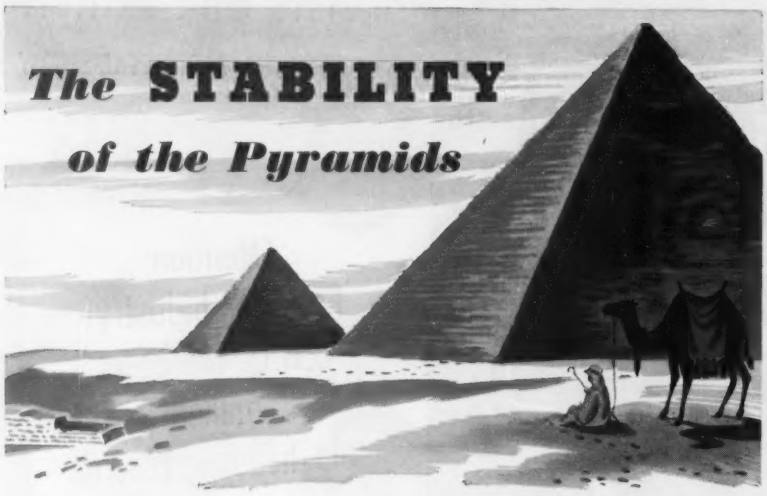
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

For more information on products advertised, use Inquiry Card, page 243



...built into every ATKINS
Silver Steel Segmental Saw!

You benefit by these design features:



Shockproof Segments are Multi-Riveted!

- stay tight longer
- minimize shifting under heavy feed pressure
- save wear and tear on plates
- prevent distortion of rivet holes
- give longer saw life

Segments *Fit Over* The Plate!

- permits *positive* inspection
- insures perfect segment assembly
- reduces chance of tooth breakage
- gives true, clean cuts—always

Get an Atkins *Silver Steel* Segmental Saw today. Call your Atkins distributor. Prompt service on all shipments and repairs.

NEW! Now Available—Atkins *Silver Steel* precision ground flat stock in all standard sizes!

ATKINS

ATKINS SAW DIVISION
BORG-WARNER CORPORATION • Indianapolis 9, Indiana

ATKINS Silver Steel SAWS BW

Modern Ind. Engrg. Co. 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5 Ind.
Mummert-Dixon Co., Hanover, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St. Worcester 6, Mass.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5 Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Simplex Machine Tool Corp., 4528 W. Mitchell St., Milwaukee, Wis.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc. 200 Lafayette St., New York 12, N. Y.

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.

(*Continued on page* 300)

For more information on products advertised, use Inquiry Card, page 243

Variac® MOTOR SPEED CONTROLS

for Adjustable, Constant-Speed Operation of D-C *Motors from* A-C *Lines*

Introduced by General Radio Company in 1949, the VARIAC® Motor Speed Control won immediate acceptance as a new and unique system for varying speed of d-c motors operating on a-c lines.

Separate selenium rectifiers for field and armature, with a VARIAC continuously-adjustable autotransformer ahead of the armature rectifier, provide a unique combination of characteristics. This is a true adjustable armature-voltage speed control in extremely simple and compact form.

VARIAC Motor Speed Controls feature:

Very Wide Speed Range—continuously-adjustable from rated speed to zero. Full rated torque can be delivered even at zero speed continuously without overheating.

No Electron Tubes — selenium rectifiers require no warm-up—motor starts immediately when the power is turned on

Excellent Controlled-Starting Characteristics—delicate equipment can be started without jerk. Heavy machines can be started very quickly.

Very Fast Start-Stop-Reverse—ample capacities permit heavy loads to be started, stopped and reversed repeatedly, without damage

Extra-Smooth Torque—satisfies the most critical requirements for low torque pulsation—excellent for such applications as precision grinding

Effectively Eliminates Need for Gears, Step Pulleys, and other types of mechanical speed changers. Any speed desired can be obtained

Low Initial Cost—Simple Installation

Long Life with minimum maintenance—no tubes to replace

Available in 9 Models for d-c motors from 1/15th hp and less to 1½ hp

Prices shown do not include motor. Standard motors for each control are sold separately and are obtainable from General Radio. Prices and specifications on request.

We sell direct. Prices shown are NET, f.o.b. Cambridge or W. Concord, Mass.



Type 1701-AK . . $75
For shunt-wound d-c motors. Toggle switch selects speed range; either 0 to rated or 0 to twice rated. All controls on panel.

Type 1701-AM . . $75
Similar to Type 1701-AK (above) except speed range 0 to rated, only. All controls on panel.



Type 1701-AU . . $75
For high-speed shunt motor performance from universal motors. Speed range 0 to rated. All controls on panel..



Type 1703-A . . $97.50
For d-c shunt or compound-wound motors. Dynamic braking for extra fast stopping. Speed range 0 to rated. All controls on panel.



Type 1700-B . . $170
For d-c shunt or compound-wound motors. Dynamic braking for extra fast stopping. Speed range 0 to rated. All controls on panel.



Type 1702-A . . $245
For d-c shunt or compound-wound motors. Dynamic braking. Speed range 0 to rated. All controls on panel.



Type 1702-M . . $350
Identical with Type 1702-A (above) except for push button operation at remote control station.



Type 1704-A . . $470
For d-c shunt or compound-wound motors. Speed range 0 to rated. For push button operation at remote control station.

Type 1705-A . . $495
Identical in size and appearance with Type 1704-A (above). For d-c shunt and compound motors. For push button operation at remote station. Speed range 0 to rated.

Since 1915
Manufacturers of Electronic Apparatus for Science and Industry

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts, U.S.A.

90 West Street **NEW YORK 6**
8055 13th St., Silver Spring, Md. **WASHINGTON, D.C.**
920 S. Michigan Avenue **CHICAGO 5**
1000 N. Seward Street **LOS ANGELES 38**

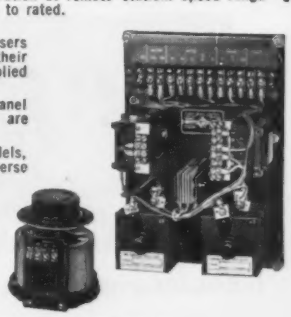
To meet the requests of many manufacturers and users who want to incorporate these versatile units into their own equipment or machines, four models are now supplied in stripped-down form.

They consist of the basic components mounted on a panel and wired to a terminal strip; all necessary leads are brought out.

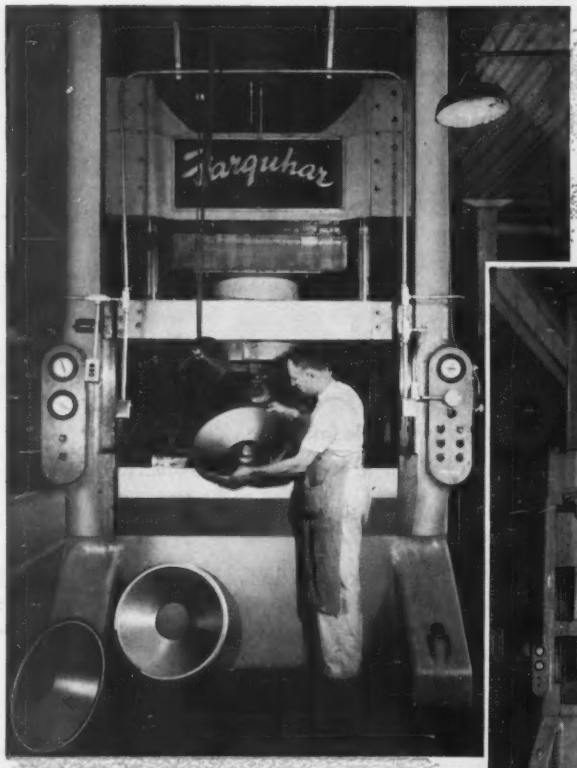
All of the standard functions of the mounted models, including fusing, dynamic braking and start-stop-reverse can be incorporated easily in the external circuits in the users equipment.

Illustrated is the Type 1700-BW for 1/4-1/3 hp motors. Unit Price: $135.00. Other models available are for 1/6, 3/4 and 1 hp.

Quantity prices on the stripped-down units are available upon request.



Write for the VARIAC MOTOR SPEED BULLETIN



Operator removing completed ceiling diffuser ring from Farquhar Hydraulic Press at Tuttle & Bailey, Inc., New Britain, Conn.



Tuttle & Bailey reports:

FARQUHAR HYDRAULIC PRESS Makes New Product Possible

Tuttle & Bailey, Inc., New Britain, Conn., produces heating convectors, ceiling diffusers, grilles, registers, etc., as well as several defense products for the United States. When production of the ceiling diffusers was first planned, the company found they could not be manufactured with existing equipment at their plant.

Tuttle & Bailey then consulted with various hydraulic press companies, searching for a design to meet their requirements. Finally, the A. B. Farquhar Company came up with the best design—*and at the lowest cost*—a 450-ton press with pressing ram speed of 0 to 45 in./min., approach and return speed of 390 in./min., and an operating hydraulic pressure of 2650 lbs./sq. in.

The company is very pleased with Farquhar's low maintenance cost, too. The press was installed in Aug. 1950, and has required no maintenance other than occasional gasket replacement.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of extra-long guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

For our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry, write to: THE OLIVER CORPORATION, A. B. FARQUHAR DIV., Hydraulic Press Dept., 1504 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES
for Bending • Forming • Forging • Straightening • Assembling • Drawing
Extruding • Juggling • Forging • and other Manufacturing Operations
THE OLIVER CORPORATION • A. B. FARQUHAR DIVISION

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bliss E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co. Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Wilson, K. R., 213 Mill St., Arcade, N. Y.
Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

(*Continued on page* 302)

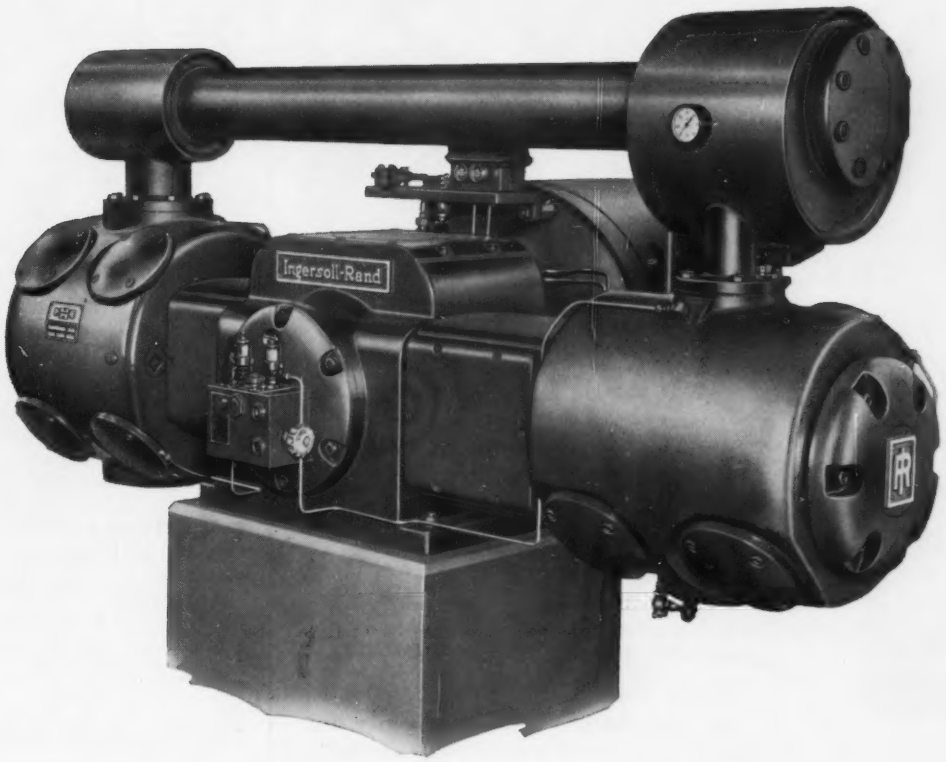
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NEW

OPPOSED-CYLINDER

BALANCED DESIGN, TYPE PHE

COMPRESSOR



COMPACT, SPACE-SAVING PACKAGED DESIGN

The new, space-saving PHE design marks another Ingersoll-Rand achievement in electric-driven compressors. Built for continuous, heavy-duty service, it includes the following outstanding features: Opposed pistons with excellent running balance — Efficient tube-type intercooler—New cylinders with Type A Channel Valves—Motor mounted directly on crankshaft—Full floating aluminum main and crank-pin bearings — Sealed crankcase — Force-feed lubrication.

FOR EASY SHIPMENT, INSTALLATION & RELOCATION

Shipped completely assembled and ready to run, the PHE compressor can be easily installed—in very little floor space—with a minimum of piping—and on a simple inexpensive foundation. Relocation, if required, is equally simple.

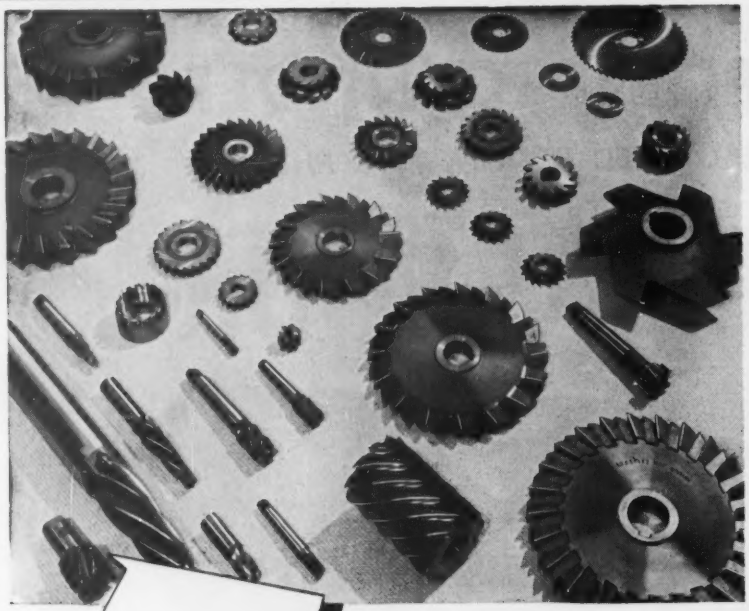
ELECTRIC-DRIVEN 75 AND 100 HP SIZES

The basic design is a two-stage unit for 80-125 psi. For other pressures, or for pumping vacuums, alternate cylinder arrangements can be supplied. It will pay you to get all the facts on this new, cost-saving design. Ask for Bulletin No. 3155.

Ingersoll-Rand

1-106 11 Broadway, New York 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES



THE *Complete Line*

GORHAM

END MILLS AND MILLING CUTTERS







For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

An extensive line of *standard* end mills and milling cutters is stocked by Gorham distributors. When you need *special* tooling, a Gorham Field Engineer surveys your problem and makes design recommendations for a tool to be "tailor-made" for your application by skilled Gorham craftsmen.

Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

Write for free 120 page catalog. Shows entire line, contains valuable engineering information.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

BURS
See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened
Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig
Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS
Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

CAMS
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN
Alleghany Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page* 304)

For more information on products advertised, use Inquiry Card, page 243

INNOCENTI

Lic. CWB



FAFT
204 147,5 mm.

COMBINED MACHINE

Milling and Boring Machine FAFT 147,5 mm. equipped whith swivelling arm, turning head and rotary table for turning, milling and dividing; working as normal milling and boring machine with eclipsable arm, and as vertical turning and boring machine with arm in working position.

Power available in the milling cutter: 40 HP.

Automatic cycles, precision stops on all movements, including rotary table, through electric control.

Pendant box controlling all feeding or rotation movements, either simultaneous or separate, spindle speed selection, locking of carriage and table.

Possibility of equipping swivelling arm with vertical milling and boring headstock.

Spindle speed (stepless range): 1,3 to 640 rpm.

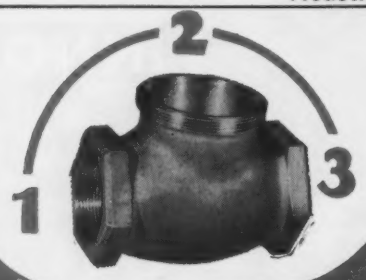
Weight: 100 tons.

INNOCENTI

SOC. GENERALE PER L'INDUSTRIA METALLURGICA E MECCANICA

MILAN — NEW YORK — PARIS

Information and literature from: Innocenti Corporation, 350 Fifth Avenue, New York 1, N.Y.

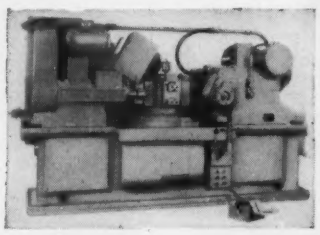


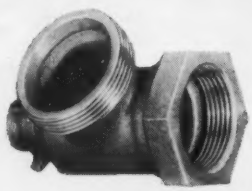
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

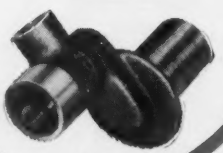
The Goss & De Leeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & De Leeuw and only Goss & De Leeuw offers this feature in a standard chucking machine.











A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW — QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

CASEHARDENING FURNACES
See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, Die
American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wisc.

CASTINGS, IRON
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Synder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe
Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd. Plymouth, Mich.

(*Continued on page* 306)

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. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT

TO GO FARTHER

FOR THE SAME "FARE"

get a Transfer

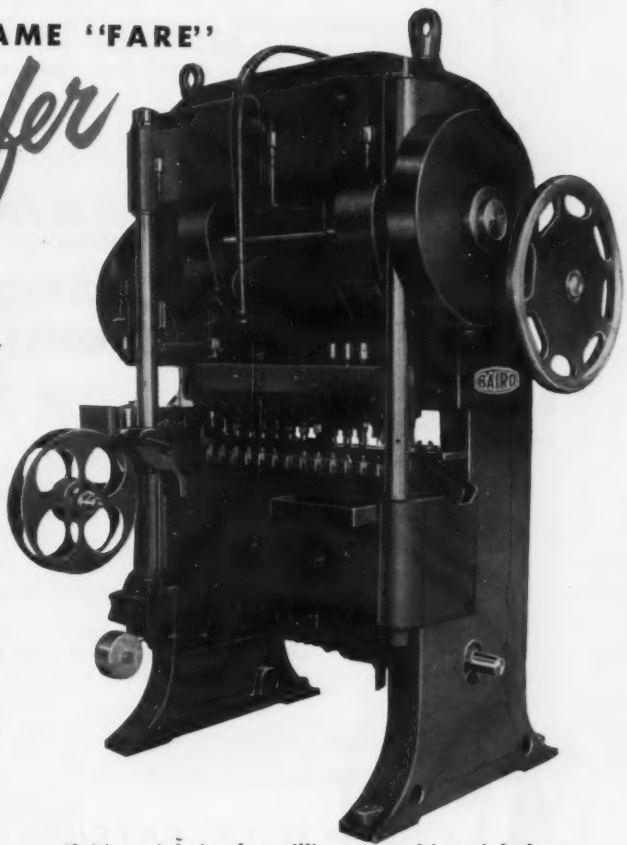
This one, completely automatic machine, the Baird Transfer Press, turns out accurately-formed metal parts at a rate of thousands of pieces per hour . . . often with 10 to 14 operations on each. Surely this is high production at its best.

Human-like transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, sizing, hexing, forming, etc., complete the piece. Such operations combined in a single cycle definitely reduce costs to a great degree.

The machine pictured is but one of 12 standard sizes which have rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed in feed lengths from 2" to 3½".

Tooling possibilities are almost endless . . . with set-ups that produce millions of small parts for the widest variety of uses.

Get yourself a "Transfer" for an extended "ride" to a favorable competitive position in this buyer's market. "Ask Baird about it." Write Dept. M.



If it's a job in the millions . . . it's a job for

BAIRD *automatic*

MULTIPLE TRANSFER PRESSES

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • THREADING DIESETS

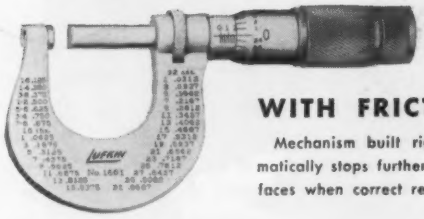
18% BIGGER BARREL

Gives Faster, Easier More Accurate Measurements

There's more space between graduations making it easier to estimate fractions of thousandths. There are longer graduation lines and the rapid reading figures marking each thousandth are larger. Non-glare Chrome-Clad satin finish on the barrel gives you easy reading even in poor light. Lufkin micrometers are easiest to adjust, too — the reading line keeps its original position directly in line of vision and the thimble doesn't cover measurements on the hub.



New LUFKIN BIG BARREL MICROMETERS



WITH FRICTION THIMBLE

Mechanism built right into the thimble automatically stops further pressure on the measuring faces when correct reading is obtained.



WITH RATCHET CAP

A Lufkin exclusive! With the ratchet completely enclosed in the cap you can still take "one hand" measurements.

A Complete New Line To Exactly Fit Your Needs

In the new Lufkin Big Barrel Micrometers you have a choice of Friction Thimble, Ratchet Cap or Direct Feel only. You can have the exclusive new Lufkin Slip-Proof black crackle finish on the frame or Chrome-Clad satin finish. You can have any style with or without lock-nut. You can have carbide tipped anvil and spindle. The new Lufkin shorter design gives you better balance and the extended anvil and tapered frame permit you to take measurements in places inaccessible to other micrometers. You'll like the new Lufkin Big Barrel Micrometers — try the one of your choice today.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR DISTRIBUTOR

312 THE LUFKIN RULE CO., SAGINAW, MICHIGAN

132-138 Lafayette St., New York City • Barrie Ont.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co., (Single and Multiple Spindle) 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schrader' Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

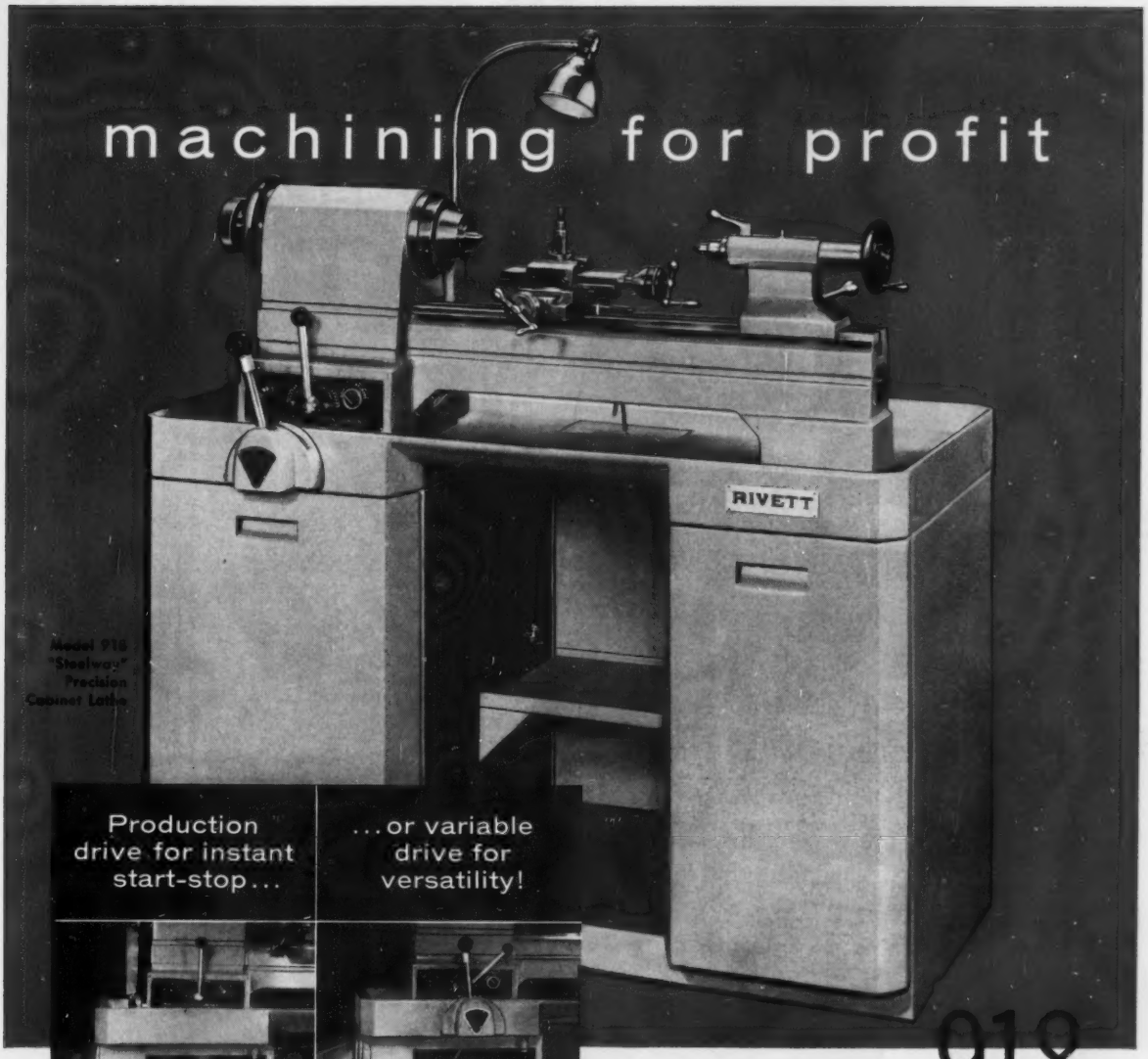
CHUCKS, Full Floating

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

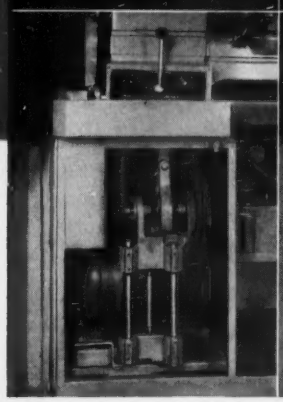
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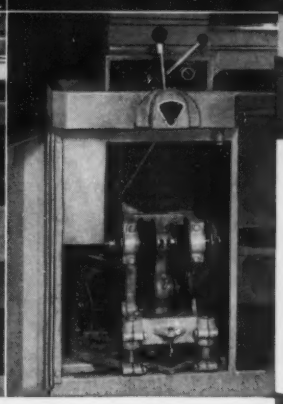
machining for profit



Production drive for instant start-stop...



...or variable drive for versatility!



RIVETT 918

earns money—produces at rates to permit surpassing your competition!

RIVETT

Use a modern lathe—consistent in size with the work to be done. Gain advantage of time-saving features—to reduce operator effort, lessen time between set-ups, permit a faster rate of production!

The Rivett 918 offers this opportunity. Many shops are taking advantage of it. Why don't you?

Write for Bulletin 918-SLB and see →



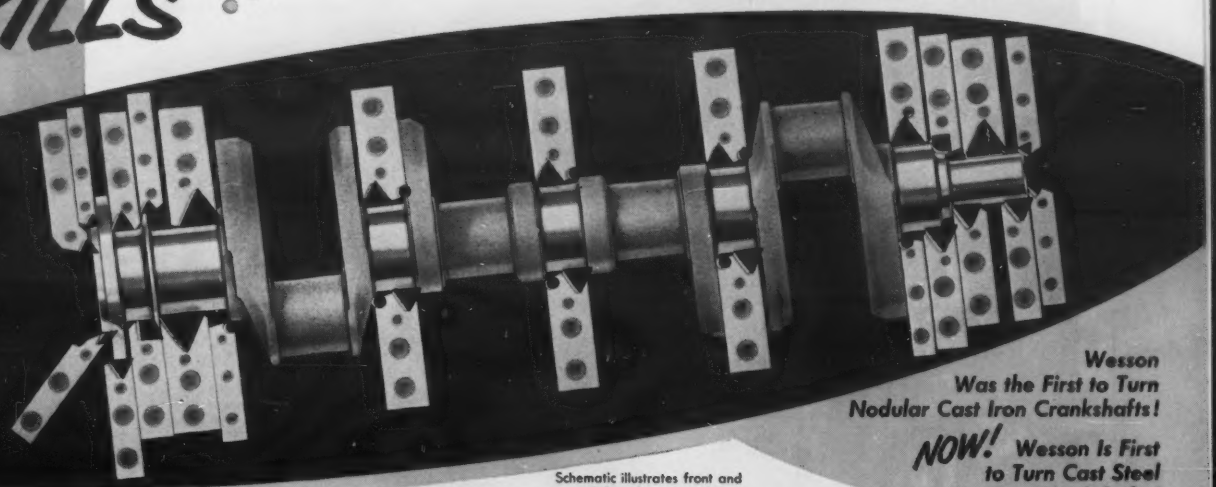
RIVETT LATHE & GRINDER, INC.—DEPT. MR-10, BRIGHTON 35, BOSTON, MASS.

WESSONMETAL
Carbide Blanks

WESSON
Carbide Cutting Tools
ENGINEERED FOR SERVICE

WICKES

COMBINED SKILLS ..... FIRST TO TURN CAST STEEL CRANKSHAFTS!



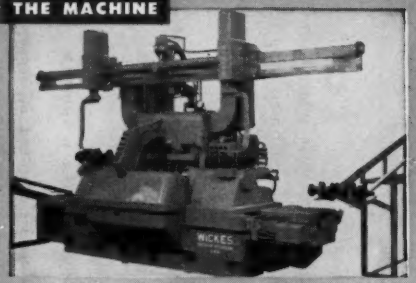
WORKING TOGETHER FOR THE BENEFIT OF ALL TO CREATE . . .

- More Productive Tools
- More Productive Machine Tools
- More Uniform Quality Carbide
- Lower Costs

Wesson Was the First to Turn Nodular Cast Iron Crankshafts!

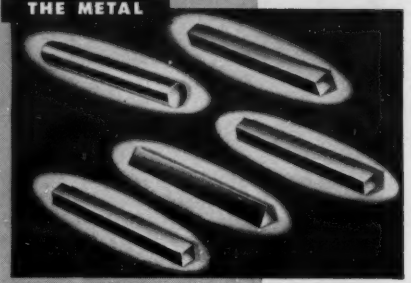
NOW! Wesson Is First to Turn Cast Steel Crankshafts!

THE MACHINE



Wickes lathes used on this tough operation are the result of engineering-design experience gained from many years of solving hundreds of specific machine tool problems.

THE METAL



Wessonmetal uniformity of grade is the key to outstanding performance in single and multiple insert set-ups on all types of material. Every Wessonmetal insert or batch of inserts is engineered to out produce on every type of operation. Wessonmetal uniformity is the result of unique and exacting quality control.

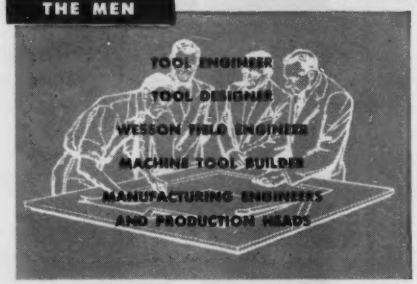
THE TOOLS

Schematic illustrates front and rear slides. Note special multiple tool adaptations possible *only* with Band-Type Multicuts!



Wesson Multicut Band-Type Tool Holders are tailor-made for single and multiple tool set-ups. Exclusive features include "built-in flush gage" for quick, accurate insert set-up" in the machine; low cost steel band is replaceable, insert removal slot permits fast and easy insert removal. The body is practically indestructible! Available in over 100 standard sizes—11 styles!

THE MEN



Credit lines above are typical of Wesson's thorough approach to "tough" tooling problems." Working together with the metallurgist, the Tool Engineer, Machine Tool Builder, and the customer, Wesson Field Engineers combine skill and experience in the solution of big jobs like the steel crank and single point tool applications in small production runs!

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY

WESSON COMPANY
1220 WOODWARD HEIGHTS BLVD., FERNDALE 20, MICHIGAN

CHUCKS, Gear

Gleason Works, 1000 University Ave., Rochester, N. Y.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.

CHUCKS, Lathes, etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co. Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardener Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines. Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St. Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York N. Y.

CLUTCHES

Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laural Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

(*Continued on page* 310)

SHIMS
ONLY
"SHIM HEADQUARTERS"
OFFERS YOU ALL 5 TYPES



THE LAMINUM® SHIM

SIMPLY PEELS FOR ADJUSTMENT

Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.



THE LAMISOL® SHIM

FOR QUICK, ASSEMBLY LINE USE

The laminations of the LAMISOL® Shim (in brass only) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.



THE LAMITAB® SHIM

FOR SUPER SPEED, THIN GAUGE SITUATIONS

The little tab holds shim laminations together firmly, yet is easily removed. Different metals can be used in the same shim.



THE LOOSE LEAF SHIM

FOR UNLIMITED FLEXIBILITY

This is the simplest of all custom-stamped shims. It is completely flexible. Usually sets including several different gauges are made up.



PACKAGED SHIM STOCK

READY FOR EASY USE, WITHOUT WASTE

Thin gauge 6" x 100" rolls feed through package slots. Heavier gauges in flat envelopes. Available from your Industrial Distributor.

*T.M. Applied For

SEND FOR LITERATURE

LAMINATED SHIM COMPANY, INC.

FLASH!
LAMINUM® Shims now made of aluminum — with all laminations surface bonded. Layers are of .003" aluminum.

3910 UNION STREET, GLENBROOK, CONN.

COSTS Go DOWN with PRODUCTION Goes UP

OLIVER ACE
Universal Tool and Cutter Grinders

Simple to set up, easy to operate, the OLIVER ACE handles a wider range of cutters than do ordinary cutter grinders, yet requires no computation. With the ACE, time lags are cut to the bone . . . the simplicity of design and operation make economy of motion and fast grinding certain. The time-proved, soundly engineered Oliver ACE effects economies in floor space and less outlay in dollars for this truly superior type machine.

Direct Reading for Clearance
—Reduces Fatigue
—Eases Operators' Jobs





Especially qualified for grinding tungsten-carbide and high speed milling cutters and tools, the Oliver ACE has only one sliding part with ample bearing, efficiently protected from dust. Only two simple fixtures are required for a general range of cutters. Quick, accurate and easy . . . the ACE is maintaining its long-standing reputation in thousands of plants for doing the job for which it is built.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.

2 MODELS: Standard and Heavy Duty (Illustrated)

Write Today for Complete Data

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

COMPOUNDS, Resin and Moulding
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER
Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.
General Radio Co., 275 Massachusetts Ave. Cambridge, Mass.

CONTROLS, Thermo
Control Products, Inc., 306 Sussex St., Harrison, N. J.

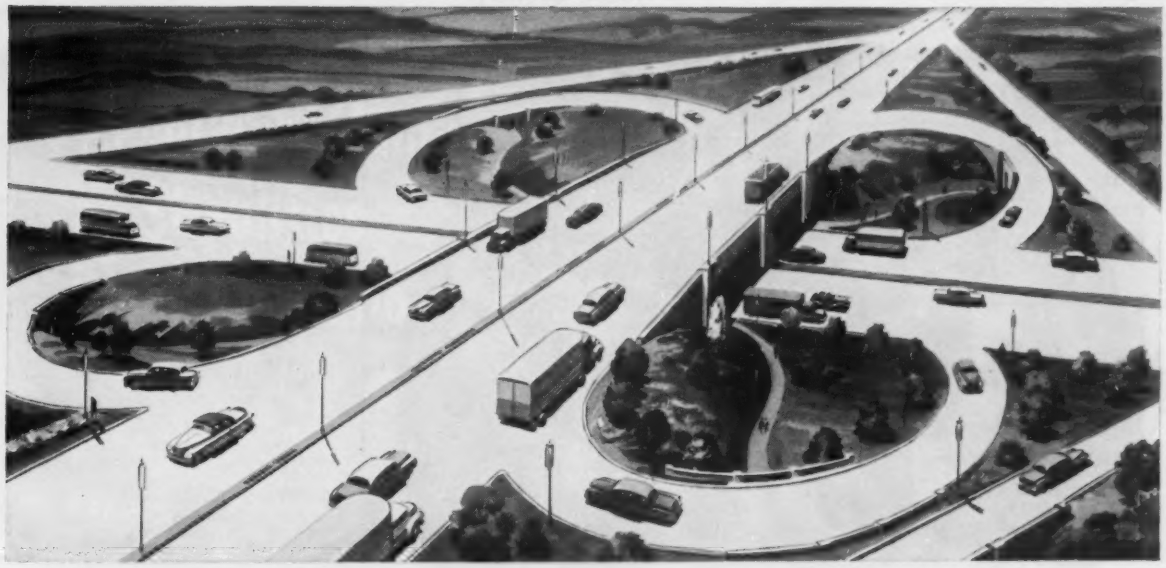
CONVEYORS FOR DUST, CHIPS, ETC.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9.

COOLANT SEPARATORS
See Separators, Oil or Coolant.

COUNTERBORES
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wison, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

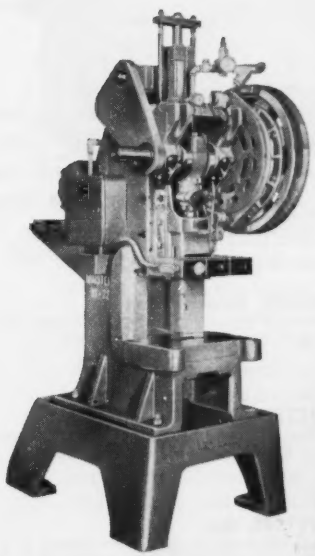
(*Continued on page* 312)

For more information on products advertised, use Inquiry Card, page 243



EFFICIENCY

...you get it with a Minster Press



■ Here's one big reason why you will obtain surprising results with a Minster Press—Minster's unusual degree of operating efficiency.

Engineered and built to do the job . . . high speeds available when they are useable . . . close control of tolerance . . . easy adjustment . . . accurate control . . . protection of dies and longer die life . . . lessened operator fatigue . . . remarkably little maintenance . . . yes, these are only a few well documented results of Minster press operation.

Check into Minsters for your own jobs. Set the standards high. You'll find Minster first in press efficiency because Minster is first in press design.

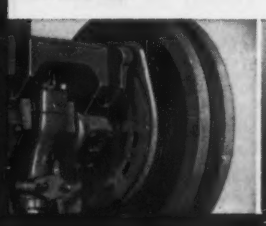
THE MINSTER MACHINE COMPANY, MINSTER, OHIO

CLUTCH
Minster's combination friction clutch and brake offers smooth, fast engagement . . . no overlaping action or drag . . . controlled operation as needed . . . exceptional friction surface life.

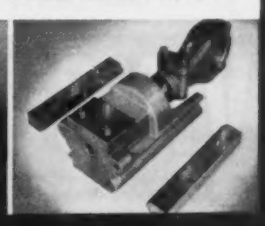
FIXED BASE
Minster's B1 press bases typify specialization for efficiency. Wide spread, close to the floor, and solid frame mounting take out sway and distribute shock of high speed feeding and stamping.

BRONZE GIBS
Long solid bronze gibs on fast gap presses require less clearance and permit more accurate slide alignment and velocity so necessary for high speed tooling. Extra long ways are another Minster feature.

MINSTER
FIRST IN **PRESS** DESIGN









The difference between a full game bag at sundown or an empty one is generally a keen nosed pointer that can "nail down" those wily cock birds. The success of many manufacturer's products has often depended upon the gear grinding specialists at Vinco. Ground gears up to 24" diameter and from 180 to 1 pitch, can be supplied. Gears from 80 pitch up to 12 pitch and in diameters up to 8½" are ground with amazing speed and accuracy on special machines designed, made and used by Vinco. Whether you need gears having very close tolerances or gears with liberal tolerances, call Vinco . . . You will learn why a Vinco specialist is your best bet.

VINCO CORPORATION, 9113 Schaefer Hwy., Detroit 28, Mich.

VINCO®

MILLIONTHS OF AN INCH FOR SALE

Metal Component Parts Mass Produced • Aircraft and Commercial Gears • Model B-1 Dresser • Precisiondex • Spline Gages Master Gears • Gear Rolling Inspection Fixtures • Camshaft Comparators • Optical Master Inspection Dividing Heads • Involute Checker.

TRADEMARK OF DEPENDABILITY

COUNTERSHAFTS
Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S. Co., Athol, Mass.

COUNTING DEVICES
Starrett, The L. S. Co., Athol, Mass.

COUPLINGS, Flexible
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.

COUPLINGS, Shaft
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

CUTTER GRINDERS
See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

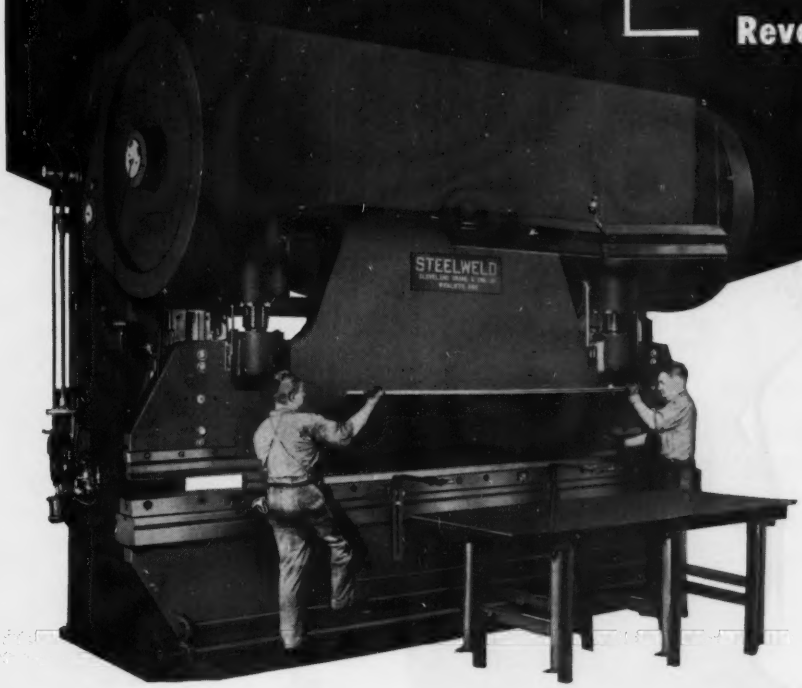
CUTTERS, Gear
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wessen Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(*Continued on page* 316)

For more information on products advertised, use Inquiry Card, page 243

Reversing Ram Simplifies Press Operation





Model MO 6-12. Handles plate to 16'-6" x 7/16". Other Steelwelds available for working plate to 24 feet and thicknesses to one inch.

With a reversing ram drive you can back the ram or upper die away from the work at any point in the stroke. It is not necessary for the ram to continue through in one direction as when only the normal press drive is provided.

This feature speeds locating the correct ram position to achieve a specified bend or shape. It saves time and spoilage when trying new dies.

Reversing ram machines have two complete drives, including motor, flywheel, clutch and brake. They are controlled by individual foot pedals on two different shafts, located one above the other across the front of the press.

The reversing ram feature is optional and may be provided on any Steelweld Bending Press. It adds greatly to the ease of operation and because of time-savings it enables, rapidly absorbs the extra original cost.

Steelweld Bending Presses are such versatile tools with so many outstanding features that we urge you to learn all about them. As a starter, send for the catalog below.



GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5457 EAST 281 STREET, WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

What an Industrial



CASE HISTORY No. 1

A Canadian plant* making an aluminum bomb nose on a turret lathe was able to get only one part per tool grind on the form tool. A heavy cut was being taken and a good finish required. We recommended SuperKool 1-M Cutting Oil. A cutter is now lasting one and one half shifts and giving approximately 200 pieces per grind.

CASE HISTORY No. 2

A midwestern company* machining 6150 steel forgings ran out of Dasco Super Soluble Base Oil and substituted a local product. Speed had to be immediately reduced as much as possible and lighter cuts taken. However, the tool still heated up and chips continued to come off blue. Dasco Super Soluble was reordered and once again chips came off bright, speeds were high and heavier cuts are again possible.

CASE HISTORY No. 3

A Canadian manufacturer* of paint trays for roller type paint applicators was applying drawing compound to the die after every other paint tray formed. Of light gauge tin plate (.015) the trays are formed in one drawing operation. Dasco No. 26 Drawing Compound was recommended. Consumption has been cut in half with Dasco No. 26 being applied after every fourth piece.

CASE HISTORY No. 4

Three large automotive plants* now use Stuart's Sturaco L-30 E.P. Slide and Way Lubricant for lubrication of machine tool gear drive units, lead screws and heavily loaded slides and ways. Sturaco L-30 has an extra high load carrying characteristic due to the addition of extreme pressure type additive materials and it has improved adhesive qualities.

*N... ...d upon request.

KLEENKUT • SOLVOL • SPEEDKUT • EXCELENE • THREDKUT

Lubrication Analysis can do for your Shop...



● Have you ever ANALYZED the efficiency of your shop? Perhaps production is now satisfactory . . . but we're talking about *efficiency.* What about tool life, fine surface finishes, down time on machines? These efficiency factors and many others are all affected by the industrial lubricants you use.

More than a "coolant" is needed to properly eliminate scuffing of the tool and workpiece, to reduce frictional wear and provide high anti-weld characteristics that prevent metallic seizure. "The Man in the Barrel", your Stuart representative, can help to solve these lubrication problems . . . and supply the proper industrial lubricant to provide superior lubricity, temperature control and chemical action.

The D. A. Stuart Oil Company's modern laboratory is constantly at work analyzing industrial lubrication problems such as you may be experiencing. They know how to develop the industrial lubricant that is *just right for your job!* Have your shop analyzed now... call "the Man in the Barrel". With 90 years of specialized company experience behind him, he's your best guide to greater efficiency.

STUART'S INDUSTRIAL LUBRICANTS

Include: Straight oil type cutting and grinding fluids, water-mix cutting and grinding fluids, drawing and stamping compounds, and lubricating oils and greases for gears, bearings and machine tool ways.



More than a "Coolant" is Needed

D.A. Stuart Oil co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Illinois
***In Canada:* Canadian D. A. Stuart Oil Co., Ltd.**
3575 Danforth Ave., Toronto



CLIP TO YOUR COMPANY LETTERHEAD AND MAIL TO

D. A. Stuart Oil Company
2739 S. Troy St., Chicago 23, Ill.

☐ Please send a copy of the Booklet, "Stuart's Cutting Oil Bases."

☐ Please have "the Man in the Barrel" call.

Name_____

Title_____

THREDKUT 99 • SUPERKOOL • CODOL • DASCO • STURACO E. P. LUBES

B. Jahn DIES PRODUCE

Every Metal Component of the Eversharp Hydro-Magic Razor!

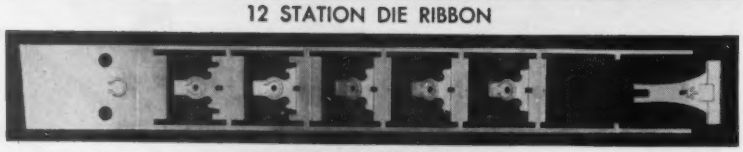


TO LESS THAN WHISKER-THIN TOLERANCES . . . WITH "PRODUCTION PROVED" PERFORMANCE AND ECONOMY!

Eversharp-Schick specified dies to mass produce a razor of superior quality . . . flawless operation . . . competitive price. Working against a tight schedule, B. Jahn evolved a series of progressive dies that turned out each individual metal component used in the razor! Every close tolerance was faithfully met — all specifications of die performance were adhered to — every requirement of product quality and accuracy was engineered and built into the dies by B. Jahn. To guarantee customer satisfaction, components were submitted to Eversharp-Schick for actual assembly line use before the dies were certified "PRODUCTION PROVED" and shipped!



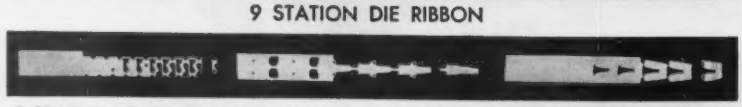
12 STATION DIE RIBBON



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Send today for the fact-packed, picture story of "B. Jahn Production Proved Dies!"

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread)
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Verner Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burs, Rotary

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

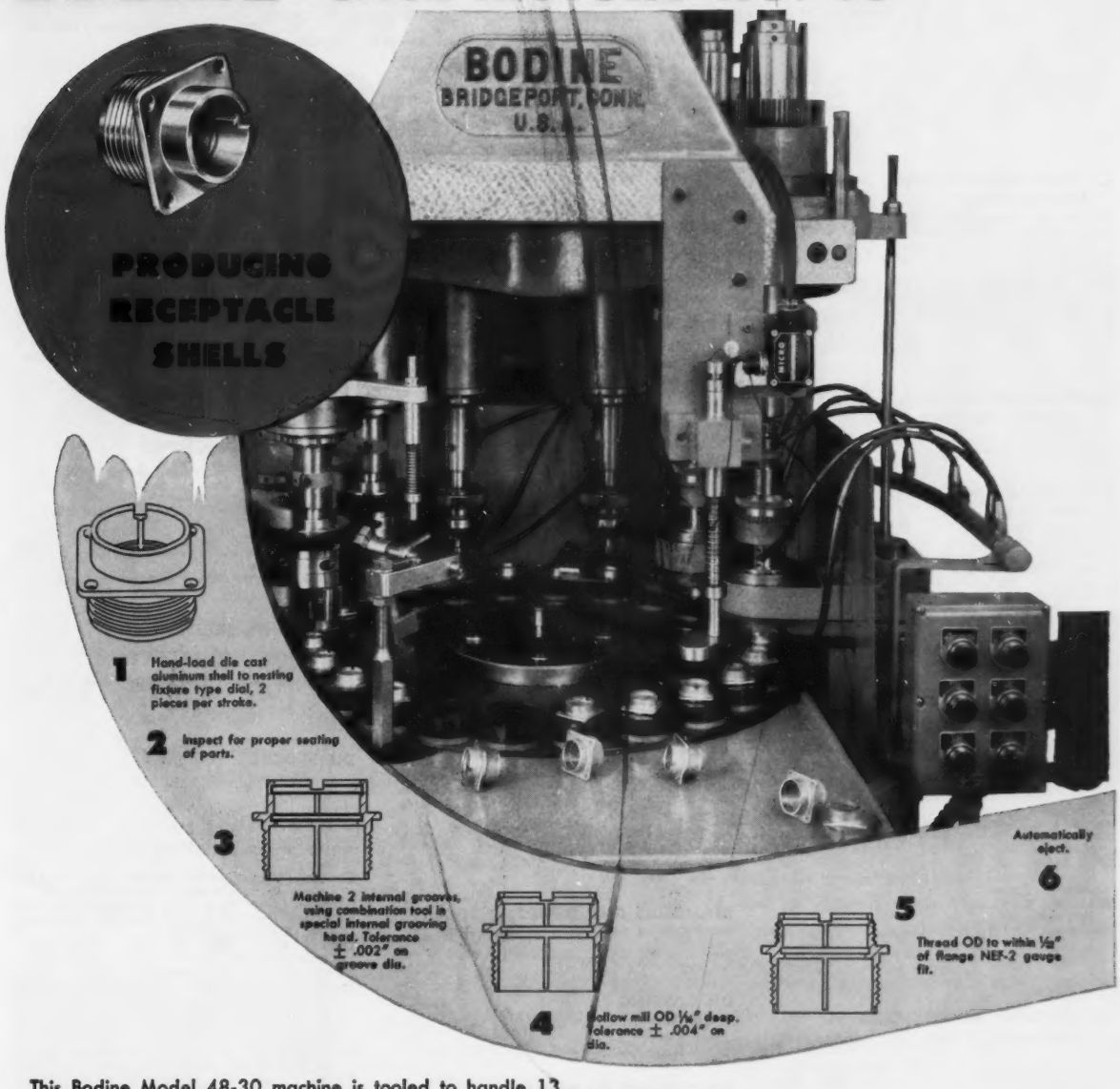
CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Master Chemical Corp., 13 Huron St., Toledo 1, Ohio.
Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

(*Continued on page* 318)

For more information on products advertised, use Inquiry Card, page 243

Bodine CASE HISTORY NO. 38



This Bodine Model 48-30 machine is tooled to handle 13 receptacle shells ranging from 7/16-27 to 1 5/8-18 NEF 2 threads. Shells are used for multiple terminals in TV, Radar, etc.

PRODUCTION: From 1,600 to 2,200 pieces per 50-minute hour, depending on size of shell.

Potentiometers next to push button station regulate two electronically controlled variable speed motors. Positive, accurate control over spindle rpm and over rate of feed gives lead-screw accuracy to the threads with a non-reversing spindle.

Bodine machines (of four types) may be tooled for an extremely wide variety of high speed repetitive production jobs . . . including drilling, tapping, threading, screw inserting, light milling, and assembly. For a true picture of cost cutting, write Dept. A-10 for our brochure "Bodine Presents 12 Typical Case Histories."

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

SBD54

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn.
Campbell Mch. Div., American Chain & Cable 929 Conn. Ave., Bridgeport, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T. & Son, Inc. 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DIAMONDS AND DIAMOND TOOLS

Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Grob, Inc., Grafton, Wis.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.

DIE SETS, Standard

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St. Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.

DIE-SINKING PRESSES

Baldwin-Lima-Hamiliton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

DIE STOCKS

See Stocks, Die

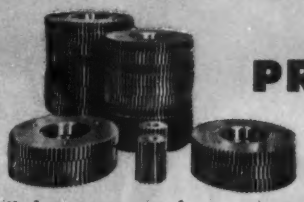
DIES, Sheet Metal, Etc.

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Jahn B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks. 683 Northland Ave., Buffalo, N. Y.
Richard Bros., Div. Allied Products Corp., 12619 Burt Rd., Detroit 23, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Winter Bros. Co., Rochester, Mich.

(*Continued on page 322*)



Cylinder gears—ground on a Reishauer ZA.

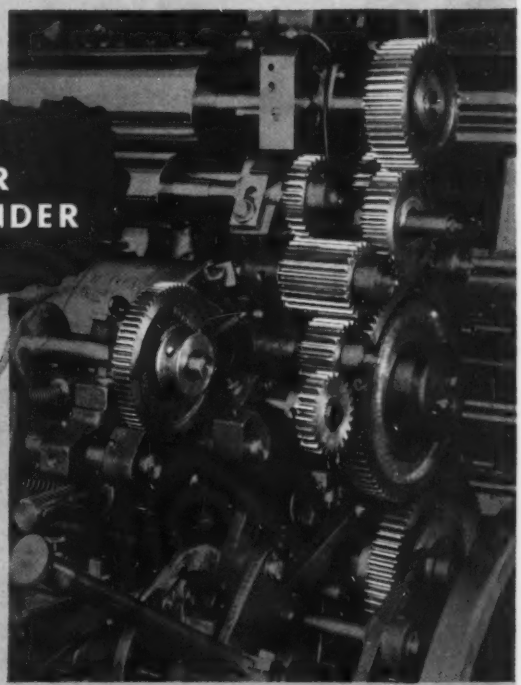
PRECISION GEARS...

the heart of fine printing presses...

are ground by AMERICAN TYPE FOUNDERS

on a

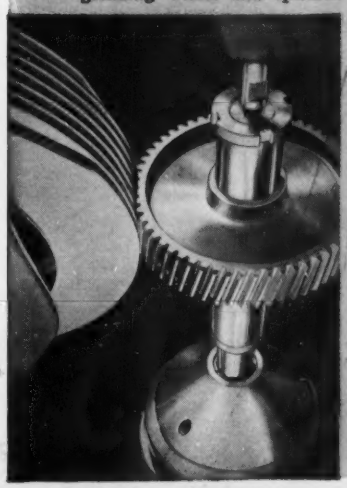
REISHAUER ZA GEAR GRINDER



Gear train on an ATF Press—ground on a Reishauer ZA.

Precision gears in a printing press are important, but cylinder gears on the ATF Chief are vital—they, in particular, must be accurately ground to prevent gear streaks on printed material, and they must be durable, to provide long-term accuracy. Therefore, ATF makes these gears from hardened alloy steel and precision-grinds them on the Reishauer ZA.

Heart of the Reishauer ZA—grinding wheel and spindle.



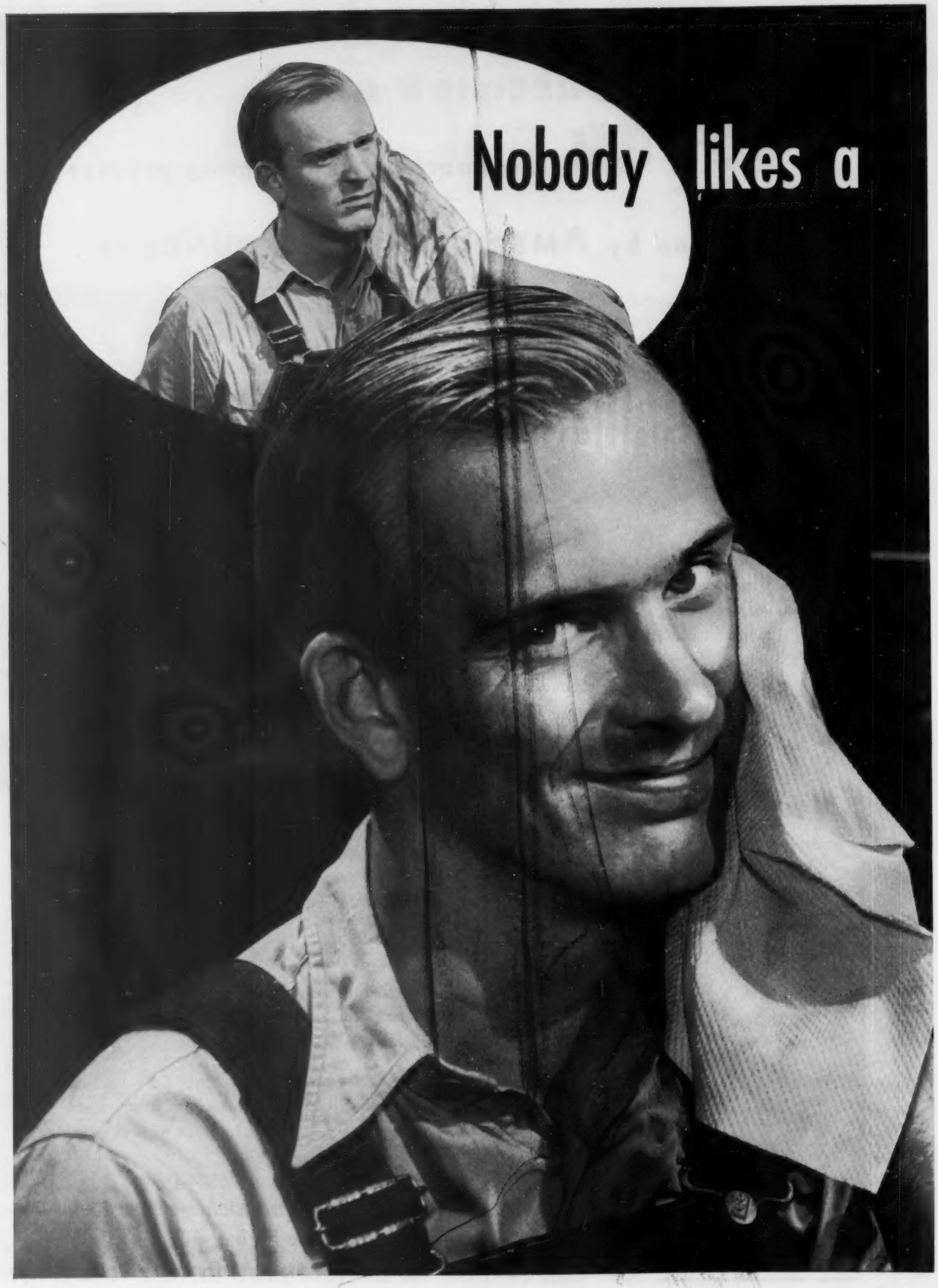
ATF is not alone in its respect for Reishauer's speed and accuracy—this machine is widely used to grind spur and helical gears in the automotive, aircraft, machine tool, gear-jobbing, and instrument industries.

Why is the Reishauer ZA so widely used? For one thing, it combines accurate grinding with production speed. For instance, floor-to-floor grinding time, on pre-hobbed gears, is about 8 to 13 seconds per inch-tooth.

There are many other reasons why the Reishauer ZA is the best production gear grinding machine you can get. If you want proof, we'll be happy to supply it. Get in touch with us soon, won't you?

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.


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dirty wiper

...Another good reason for switching to **Scott Wipers!**

Because a clean, fresh one is always available—Scott Wipers provide a constant source of clean chip-free wiping material.

Scott Wipers are sanitary and disposable. They greatly reduce the costly scratches and digs in finished work caused by chips lodged in wiping materials. They end the laundering problem and simplify distribution and control.

Scott Industrial Wipers are two-ply and tough yet soft and absorbent. Compare them with whatever wiping material you're using now—for cost, for convenience, for performance.

The Scott representative or distributor in your area will be glad to help you set up a production line demonstration in your plant. Call him or mail this coupon today.



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Please send me full information on Scott Industrial Wipers.

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Company_____

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DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co. Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave. Brooklyn 22, N. Y.

DISINTEGRATORS

Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment

DOWELL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 N. Laural Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plains, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Etto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Govro-Nelson Co., Detroit 8, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Keller Tool Co., Grand Haven, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STOPS

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

DRILLING MACHINES, Automatic

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch. Co., 126 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Walker-Turner Div., Kearney & Treckar Corp., 900 North Ave., Plainfield, N. J.

DRILLING MACHINES, BOILER

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.

DRILLING MACHINES, Gang

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

DRILLING MACHINES, Horiz. Duplex

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.

(*Continued on page* 324)

Specialists in AUTOMATIC MACHINES

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

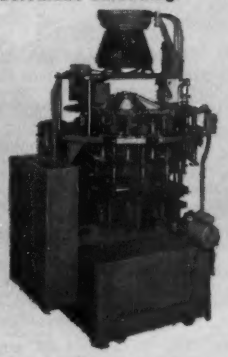
Since 1919

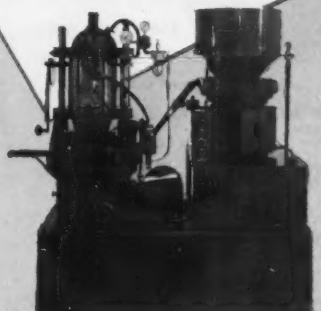
Swanson offers a fully integrated organization experienced in engineering and building special automatic machines for machining, processing and assembling small and medium parts. Illustrated are typical examples of Swanson special machines which are improving quality and lowering costs in a wide range of manufacturing operations. Because they incorporate Swanson-developed standard components wherever applicable, both time and money were saved in their completion.

If you have a problem in automation, tell us about it. We'd like to help.

Your inquiries will be treated in full confidence . . . our recommendations submitted without obligation.

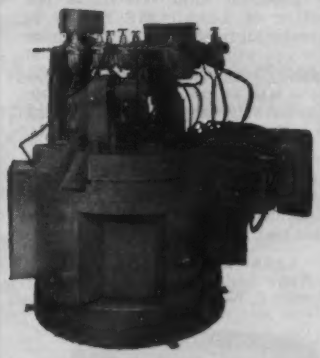
Completely automatic turret type machine for processing four electronic parts simultaneously at each index. Equipped with hopper feed, automatic chucking, transfer mechanism, Swanson-designed memory device and automatic unloading.





An automatic straight-line indexing machine, designed for injecting cement into flash bulb bases. Machines of this type have increased previous production rates by three to five times.

This special machine for drilling, tapping, reaming and counterboring cigarette lighter parts at 1200 per hour, was designed and built around a standard 8-station Swanson Turret Indexing Unit.



SWANSON TOOL & MACHINE PRODUCTS, INC.

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by

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The introduction of LUBRIPLATE Lubricants established a new high standard for industrial lubrication. Now, a recently patented improvement in the production of LUBRIPLATE results in even greater lubrication efficiency. Under today's operating costs, reduction of down time, less parts wear and replacements, as well as lower power consumption, far outweigh any differential in the initial cost of LUBRIPLATE Lubricants.

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National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Cal.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry, Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3368 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foot-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foot-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Upright

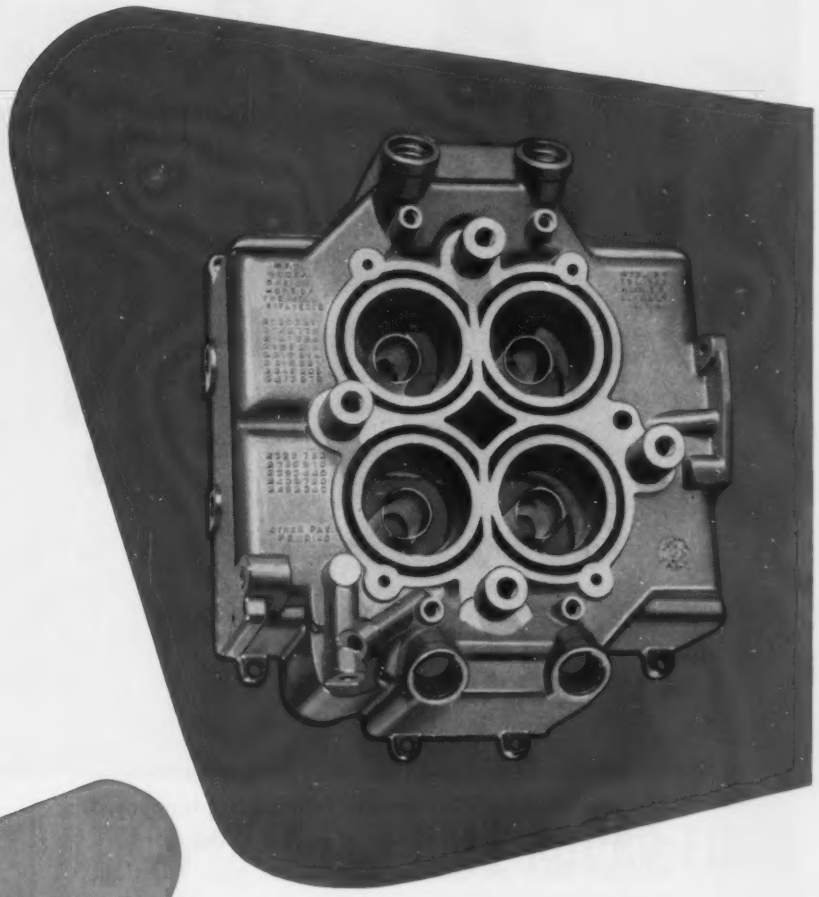
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

(*Continued on page 326*)

How would you do all these operations?

. . . fast, with utmost precision, at lowest cost

DRILL	2	HOLES
TAP	2	HOLES
DRILL	2	HOLES
REAM	2	HOLES
TAP	2	HOLES
FACE	4	SURFACES
CLEANOUT	4	DIAMETERS
FACE	4	SURFACES
TAP	2	HOLES
REAM	2	HOLES
DRILL	2	HOLES
TAP	2	HOLES
DRILL	2	HOLES





Ask your Morris representative for details on our deferred payment plan.

Here's the Morris Mor-Speed answer

. . . combining 32 operations, delivering up to 375 parts per hour!

Imagine the machines, and floor space required to do this part on a separate machine basis! Instead, there's just one machine, producing approximately six parts per minute!

Important too, there's no sky-high "special machine" price tag on this or any Morris MOR-SPEED. Standard machining units are grouped on a standard base, around a standard indexing table and provided with the necessary tooling. The result is high production at lowest cost.

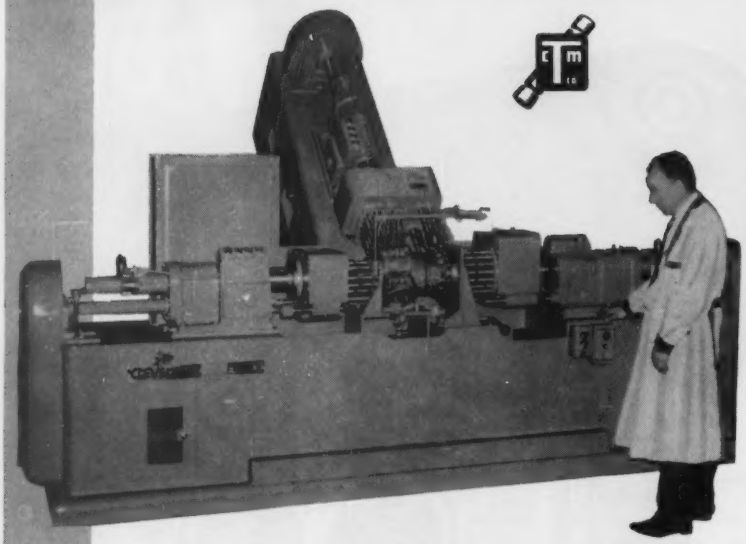
Although your multiple drilling, tapping, reaming and similar operations may not be as complicated as this Morris installation, chances are Morris Engineers can show you proof of substantial savings. Investigate today.

Builders of MOR-SPEED Time

Morris

THE MORRIS MACHINE TOOL COMPANY, 946 HARRIET ST., CINCINNATI 9, OHIO

Another Cleveland Design to Speed Production!



3-WAY HORIZONTAL TAPPING MACHINE

OPERATION: Tapping 48 holes in crankcase. Tapping time (48 holes) 7.9 seconds.

DESCRIPTION: A Cleveland Three Way Horizontal Tapping Machine with two F-2 Cleveland Tapping Heads opposed at each side and one F-2 head at 45° up at the rear with multiple heads on each head to suit the part. The right hand tapping head has a multiple head with 18 spindles; the left hand tapping head has a multiple head with 12 spindles; the rear vertical unit has a multiple head with 20 spindles.

The operator loads part into position between the tap guard plates and then moves the lever to the closed position and starts the machine. All heads tap simultaneously.

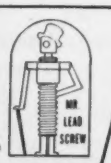


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CLEVELAND tapping machine co.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC. • CANTON 6, OHIO



Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Corboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterilng, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd. Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric

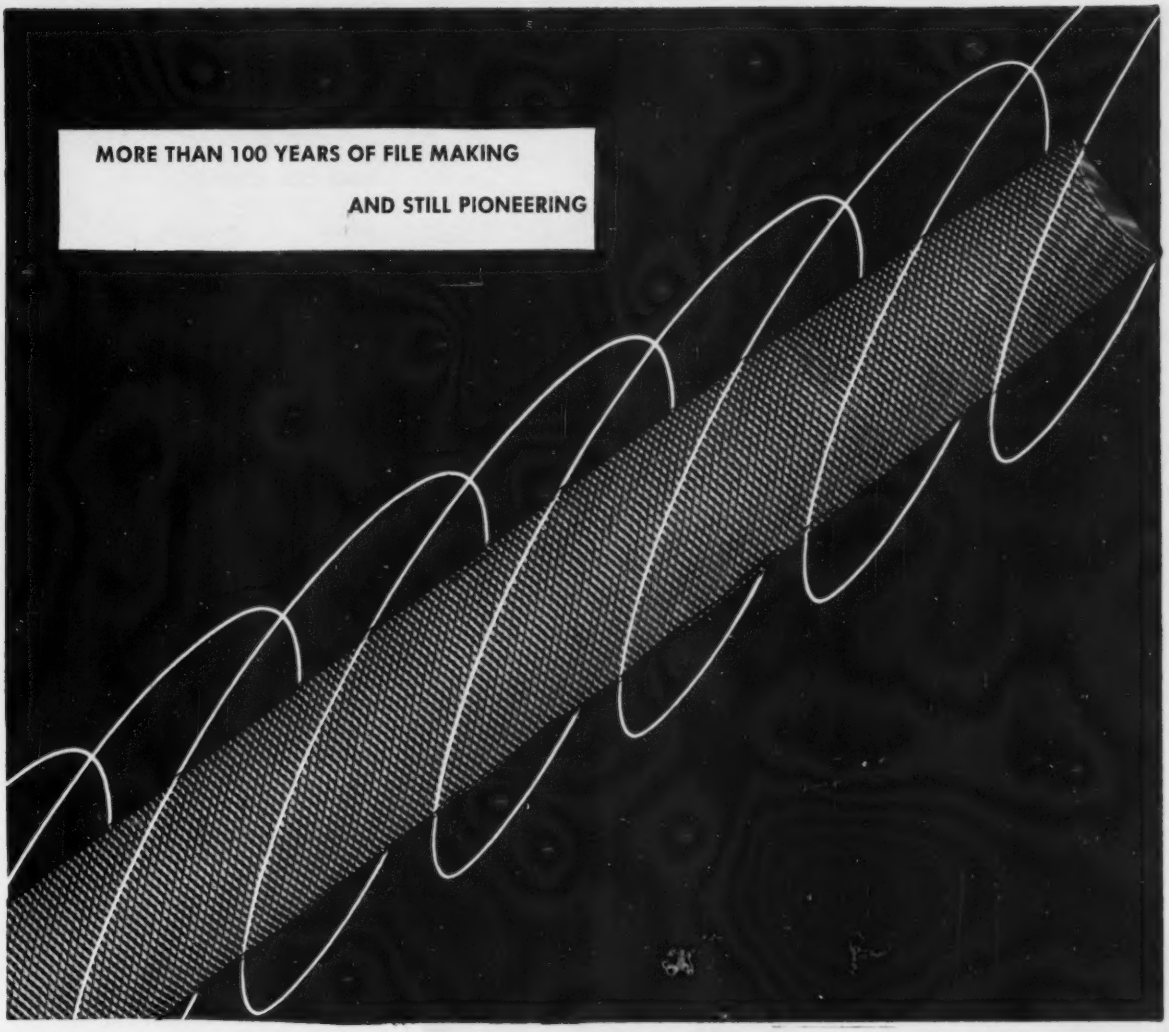
Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St. New York 9, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

(*Continued on page* 328)

For more information on products advertised, use Inquiry Card, page 243



HELLER WAS FIRST WITH *SPIRAL-CUT* HALF ROUND FILES

Ordinary half round files require a skillful twisting of the file to produce smooth, even work. Heller engineering has removed this human element from good file performance with exclusive Spiral-Cut Half Round Files. The necessary "rolling action" is designed right into the file. This new cutting principle is typical of Heller's continuous search for better files. By constantly testing, inspecting, improving . . . Heller guarantees file users "the best."

other Heller Firsts

NUCUT* Wavy-Teeth Files
VIXEN Milled Curved Tooth Files
WAVY-TEETH* Double Cut Mill and Saw Files

***Registered T.M.**

VIXEN
American-Swiss
NUCUT

THESE 3 FAMOUS BRANDS ARE MADE ONLY BY

HELLER BROTHERS TRADE MARK SINCE 1839

HELLER BROTHERS CO. *America's Oldest File Manufacturer* **NEWCOMERSTOWN, OHIO**

YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

DRILLS, Ratchet
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago III.
Chicago-Latrobe Twist Drill Works 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago III.
Greenfield Tap & Die Corp. Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRIVES, Chain
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.



MULTIPLY PROFITS BY MULTIPLE OPERATIONS

Part:
Steering gear housing. (Two different parts run on same machine with tool change only.)
Material: Malleable iron.
Operation: *Station 1*—Load and unload. *Station 2*—Drill (3) .368" holes; (1) .120" hole. *Station 3*—Combination spot face and chamfer (3) holes, drill (1) 23/32" hole for tapping. *Station 4*—Tap (3) 7/16"-14 NC-3 thread; tap 1/2"-14 NPSF thread.
Description: Millholland 4-station automatic index machine equipped with 4-station automatic index table, with 1 No. 5 Millholland Automatic Unit driven by 7-1/2 HP motor with 8-spindle ball bearing multiple head for drilling 5 holes and combination spot facing and chamfering 3 holes; 4-spindle tapper on right-hand column.
Operator loads part and pushes button initiating automatic cycle, unloads. Two parts machined at a time.

MILLHOLLAND ENGINEERED FOR MAXIMUM PRODUCTION

For special production machines, Millholland Automatic Units offer distinct advantages. These self-contained units, driven by individual motors, are readily adapted to a wide range of operations. Their full automatic cycle with interlocked controls permits several units to be grouped for simultaneous operations, or they can be mounted on other production machines and synchronized to perform additional operations. Millholland Automatic Units have proved themselves in 30 years of outstanding performance on all types of jobs. Get full details in Bulletin M-10.

W. K. MILLHOLLAND MACHINERY CO.
6402 Westfield Blvd., Indianapolis 2, Indiana

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Gorton, George, Mch. Co. 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Richford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

DUST COLLECTORS
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS
Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT
General Electric Co., Schnectady 5, N. Y.

EMERY WHEEL DRESSERS
See Dressers, Grinding Wheel

EMERY WHEELS
See Grinding Wheels

ENGRAVING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Drill
Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

EXTRACTORS, Screw
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating
Buffalo Forge Co., 490 Broadway, Buffalo. N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic
Federal Press Co., 600 Division and Big Four R. R. Elkhart, Ind.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications
American Felt Co., Glenville, Conn.

FILES, Hack
DoAll Co., 254 Laural Ave., Des Plaines, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

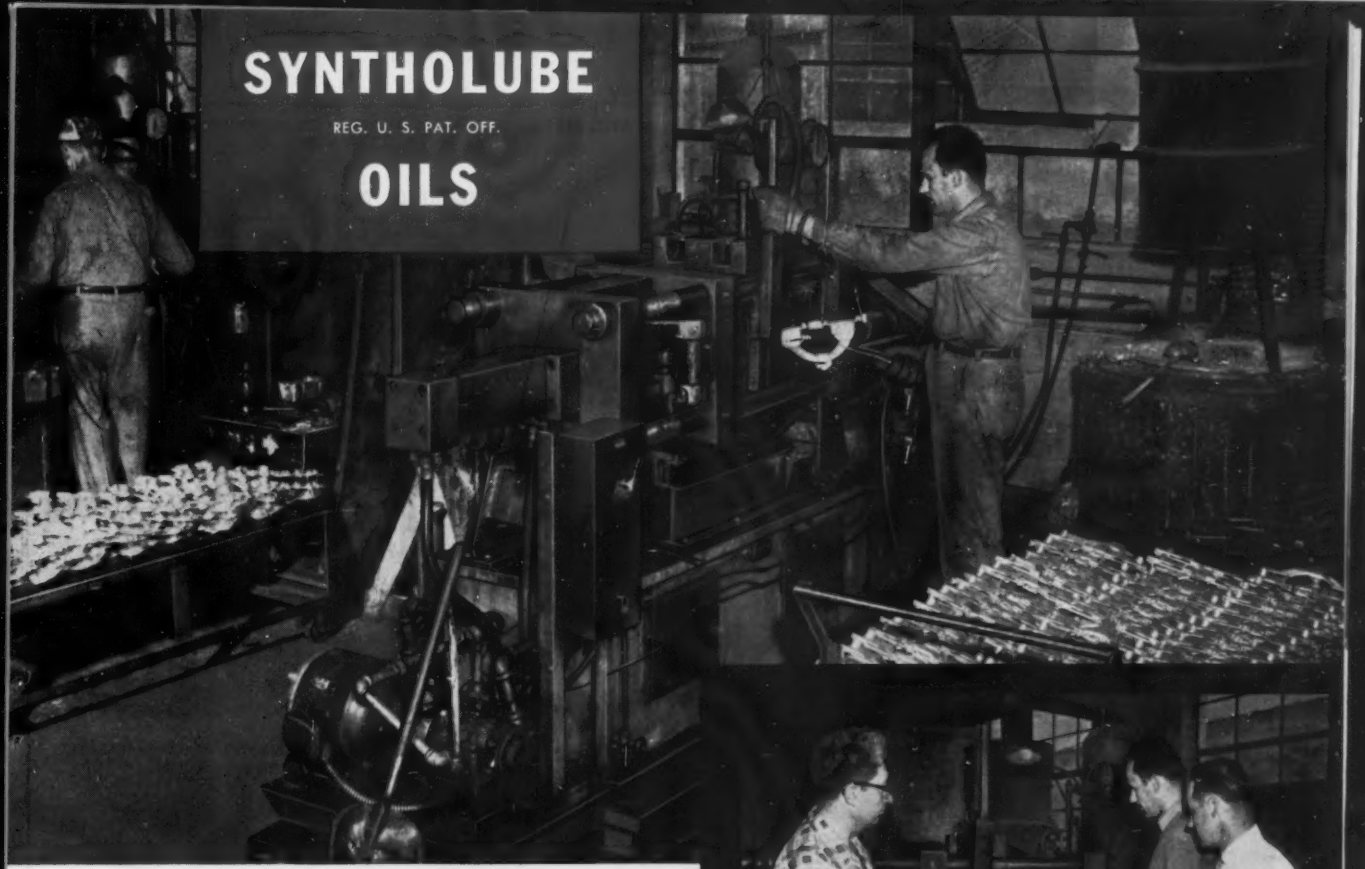
FILES, Hand
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES Machine
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(*Continued on page* 330)

For more information on products advertised, use Inquiry Card, page 243



Mr. Simon Slutsky (left), co-owner of Atlantic Die Casting Company, and Mr. L. J. Loomis (extreme right), Standard's lubrication specialist, watch machine operator use the somewhat unique spray method devised to apply SYNTHOLUBE Oil to hot and hard-to-lubricate parts of die casting machine.

Beats heat in die casting machines...

● The Atlantic Die Casting Company specializes in aluminum die casting. Using hydraulic machines of its own design, this company turns out amazingly intricate parts at a high rate of production. But it was not always easy going.

There had been a problem of lubrication. The exceedingly high temperatures necessary for die casting made it difficult to lubricate machine parts in the area of the heated dies. Various expensive and complicated lubricating mixtures were tried. Under the high temperatures, the lubricants thinned and did not cling well to the hot surfaces. Oxidation of the lubricants produced deposits. Resulting troubles: sticking of machine parts, particularly ejector pins; staining of aluminum castings, down-time for cleaning.

Consulted on this problem, a Standard Oil lubrication specialist recommended the lubricant that had been developed by Standard Oil for just such high temperature applications: SYNTHOLUBE Oil.

This unique product has made short work of the lubrication troubles. It does not "run" from hot surfaces. Its unusual depolymerizing characteristic has prevented the formation of troublesome deposits. In addition to other lubricating benefits, SYNTHOLUBE has eliminated the expense of using costly lubricating mixtures.

Whatever your lubricating problem or need, you'll find that a Standard Oil lubrication specialist has the engineering ability and the petroleum product to help you. You can reach the specialist serving your area of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 So. Michigan Ave., Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD *(Indiana)*

FILING MACHINES, Dies, Etc.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob, Inc., Grafton, Wis.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air
Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engrg. Corp., Meriden, Conn.
Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

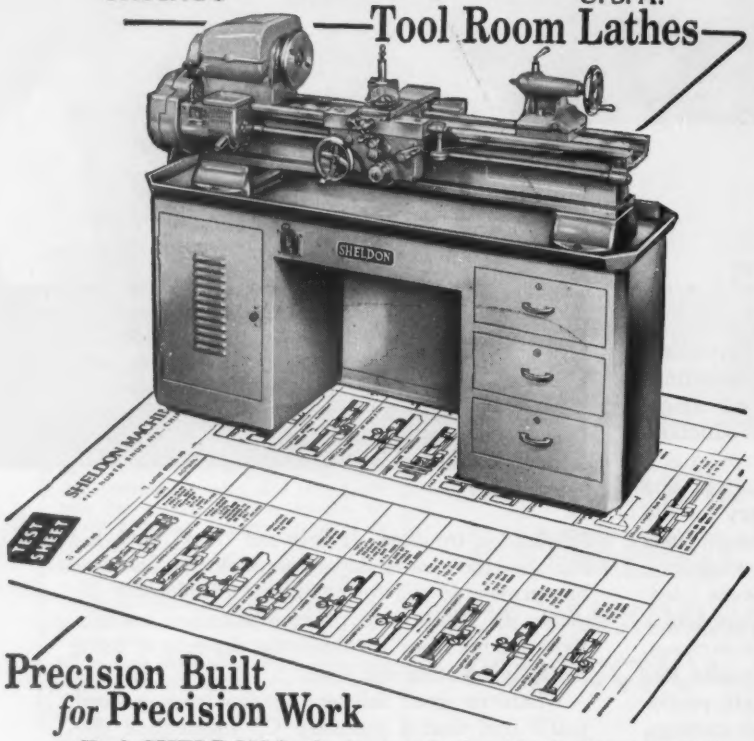
FINISHES FOR MACHINES AND METAL PARTS
Lowe Bros. Co., Dayton, Ohio.

FLEXIBLE COUPLINGS
See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT
Pratt & Whitney West Hartford 1, Conn.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

FORGINGS, (Upsetting) Machines
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHELDON
CHICAGO U. S. A.
—Tool Room Lathes—



Precision Built
for Precision Work

Each SHELDON Lathe is a precision machine tool that in final inspection has passed the 19 accuracy checks on the SHELDON "Inspection Test Sheet."

Produced by modern methods with the finest special machines, these 10″, 11″ and 12″ (swings 13″) lathes are quality built on a quantity production basis. Selling at quantity production prices they are today's best lathe values.

Write for Catalog with Check Chart

SHELDON MACHINE CO., INC. 4246 North Knox Ave., Chicago 41, Illinois

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

FORGINGS, Drop
Bethlehem Steel Co. Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
Cameron Iron Works, Inc., 1000 Silber Rd., Houston, Texas.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FORMING TOOLS or Tool Blanks
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded
Mahon, R. H. Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FURNACES, Heat-Treating
General Electric Co., Schenectady 5, N. Y.

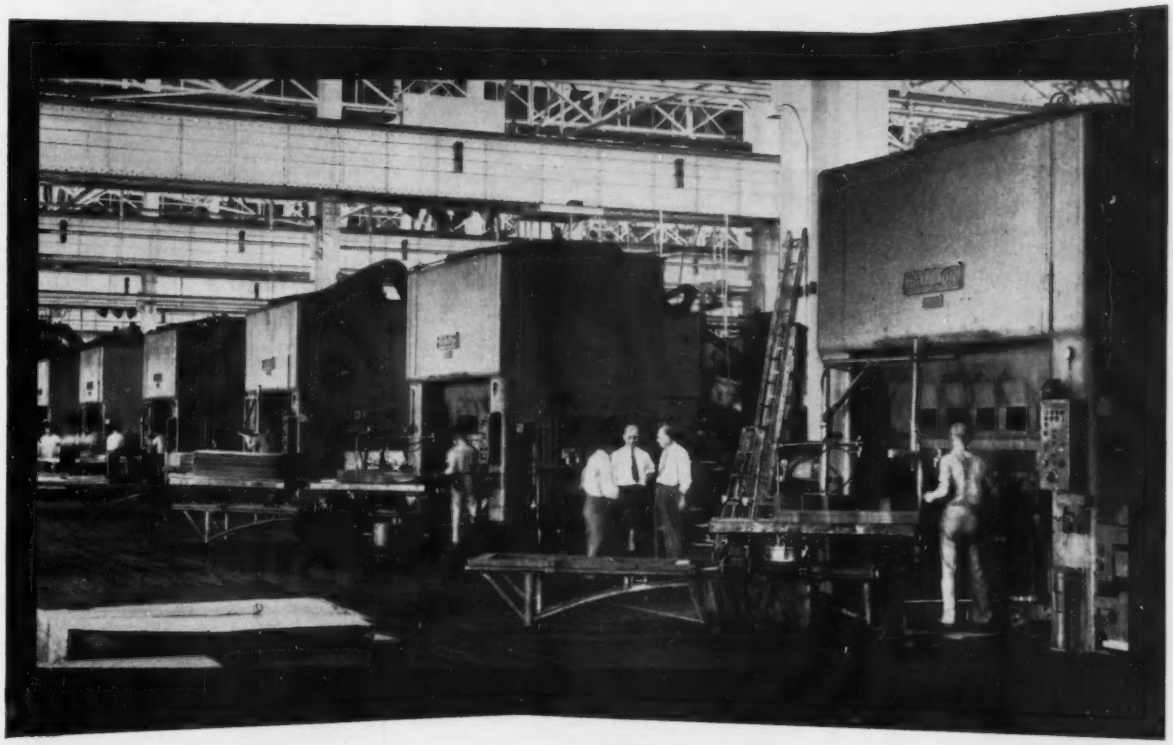
(*Continued on page* 332)

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head more than three-quarters
of the master production lines in the
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FURNITURE, Shop
Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc. 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator
Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Ames, B. C., Co., Waltham 54, Mass.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St. New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth
Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co. Inc. 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket R. I.

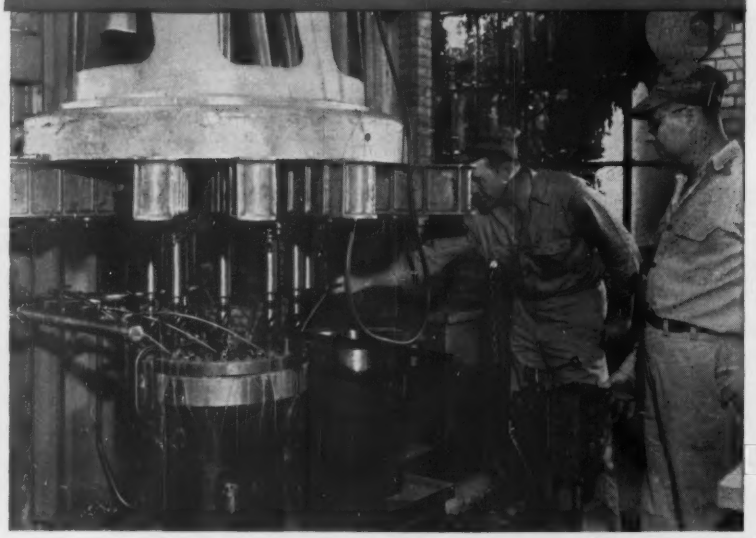
GAGES, Electric
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027 Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height
Amco Gage Co., 19760 W. 8 Mile Rd. Detroit 19, Mich.
Ames, B. C., Co., Waltham 54 Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp. 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol Mass.

GAGES, Plug, Ring and Snap
Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp. 721 Springfield, Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co. Athol Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros. Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page* 334)

FULL *8-Hour* SHIFTS WITHOUT A GRIND



These standard W & B high speed drills keep going for a full eight hours on each grinding—no shut-downs during shifts for resharpening or replacement of dull drills for this manufacturer of oil and gas well head equipment.

Casing heads are alloy steel having a Brinell hardness of 185-260. Drilling of bolt holes in casing head flange is done on a 16 spindle "Hole Hog." Operated at 126 R.P.M. and with a .015" feed per revolution, the high speed W & B drills quickly and efficiently complete the drilling of twenty 1½" diameter holes 3" deep in each flange.

This example of unusual drill durability and efficiency is indicative of the high performance you, too, can have by specifying W & B for your drilling operations.

W&B

REAMERS
COUNTERBORES
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CARBIDE TOOLS
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SPECIAL TOOLS

YOUR INDUSTRIAL DISTRIBUTOR
Can Give You Quick Service
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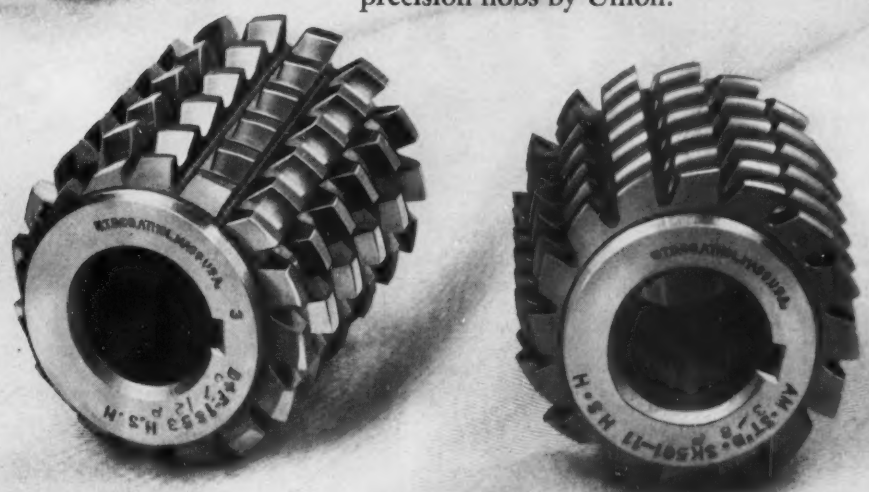
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U N I O N



Precision was built into every detail of this Nineteenth Century clock.

Today, the finest gears are mechanically reproduced by means of precision-built hobs. For the best in hobs — demand precision hobs by Union.



Renaissance 19th Century French Clock, made in Paris by RAINGO, *Circa* 1840

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Parallel Spline
Worm Gear
Tangential
Spur Gear
Helical Gear
Ground
Unground
Accurate Unground
Finishing
Roughing
Preshave
Protuberance
Stub-Tooth
Standard Gear
Composite Form
Combination Pitch
Topping
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Non-Topping
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Shank Type
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Serration
Square Shaft
Tapered Hole
Multiple Thread
Special Shape

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Silent Chain
Roller Chain
Special

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

***OWNERS AND OPERATORS OF:* S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.**
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

CUT INVENTORY COSTS, ORDER FROM YOUR LOCAL DISTRIBUTOR

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Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co. 22038 Beech St., Dearborn, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Iroquois Corp., RFD 4 Box 331, 1800 E. 11 Mile Rd., Royal Oak, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, SPUR and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

(*Continued on page 336*)



How to Straighten Flap Tracks

Precision parts for aircraft call for the use of precision equipment.

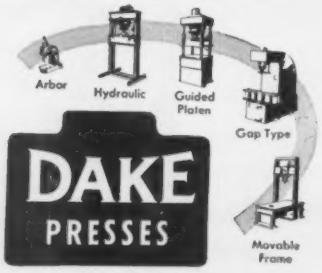
These flap tracks, machined from 4130 steel (aircraft quality), must be checked on a straightening press four times during fabrication. For ease of control and accuracy, the work is done on Dake Gap Type Presses like that shown in the photograph above.

To the right of the ram, the operator has placed a rule gauge which indicates ram travel. Knowing the elasticity of the piece being tested, he can estimate the overtravel necessary to straighten the piece with a single movement of the ram.

Dake Gap Type Press broaches boring bars

Dake Gap Type Presses are available for straightening or forcing, in 22 models ranging up to 300 tons capacity. They are fully described in Bulletin No. 299—sent on request.

Dake Engine Company, 604 Seventh St., Grand Haven, Mich.



Send for Big New Catalog

DAKE ENGINE COMPANY
604 Seventh St., Grand Haven, Mich.

Please send me a copy of Dake Catalog No. 129

Name_____

Company_____

Address_____

City_____ Zone____ State_____

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National Tool Co.



Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

Cosa Corp. 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 Rover St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

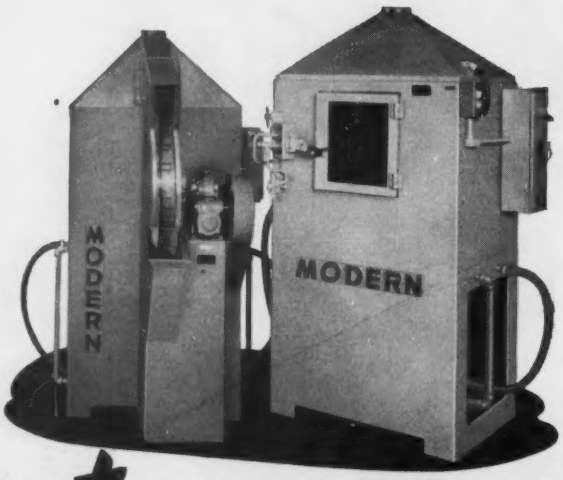
GEARS, CUT

Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micron Gear Mfg. Co., 102-38 Corona Ave., Corona, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.
New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Perkins Machine & Gear Co., West Springfield, Mass.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.

(*Continued on page* 338)



Larger parts are deburred in Maizo Blast machine (right) with stationary fixture. Operation is automatic when door is closed. Small parts are deburred in model with continuously rotating ferris-wheel type fixture (left).

Blast THOSE BURRS! with Modern Maizo Blast

If you're being plagued with light burrs on high-production metal parts, get Modern Maizo Blast equipment and forget them.

Simply load the parts into a continuously rotating fixture if they're small—larger parts are placed on a stationary fixture in a door-operated model. The rest is automatic. A blast of high-pressure air containing ground maize or walnut shells quickly whisks off burrs. Proper blasting material enables you to deburr without pitting finished surfaces.

Outstanding performance and quality are notable features of Maizo Blast equipment. That's because it's made by the maker of the famous Burr-Masters, the fastest production gear burring and chamfering machines available. Modern has put the same "know-how" into the Maizo Blast design to give the utmost in operating efficiency.

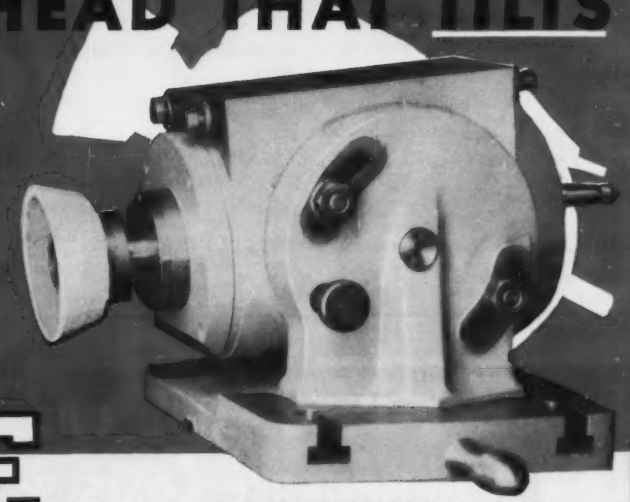
Write today for Bulletin 103-57 covering Maizo Blast equipment for both small and larger parts.

MODERN
Industrial Engineering Co.
14230 BIRWOOD AVE.
DETROIT 4, MICH.

For more information on products advertised, use Inquiry Card, page 243

HERE'S A HEAD THAT TILTS

and Yours Will Nod, Too When You See What You Can Do With This One

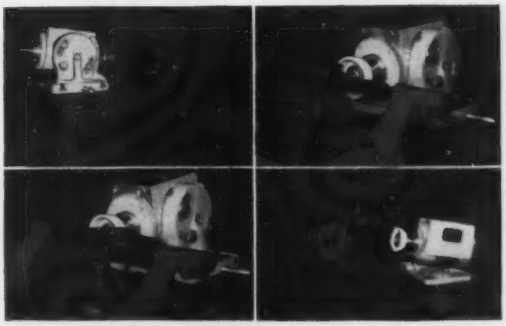


POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane

Give this versatile head the nod and save time and money these seven ways:

1. You can use cup wheels for practically all clearance angles and thus produce a cutting edge on tools that lasts longer because it is stronger.
2. You can keep the tooth rest on the center line of the cutter for practically all grinding on centers or in the work head.
3. You can grind most cutters and reamers all over *with a single set-up* using the swivelling table and Pope tilting head.
4. You can read all clearance angles directly in degrees from the scale provided on the head. No more mistakes.
5. You can get the right clearance angle on such tough grinding jobs as slab mills, taper reamers, angular cutters and form tools.
6. You have one safe speed — 3600 RPM — for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
7. You have a head that's so easy to adjust and use it saves you time and money every time you grind a tool.



Ask us to submit complete specifications including price and delivery.

No. 101

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS

Cincinnati Gear Co., Wooster Pike and Marlemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.

Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

GRINDING FIXTURES

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio
Walker-Turner Div. Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

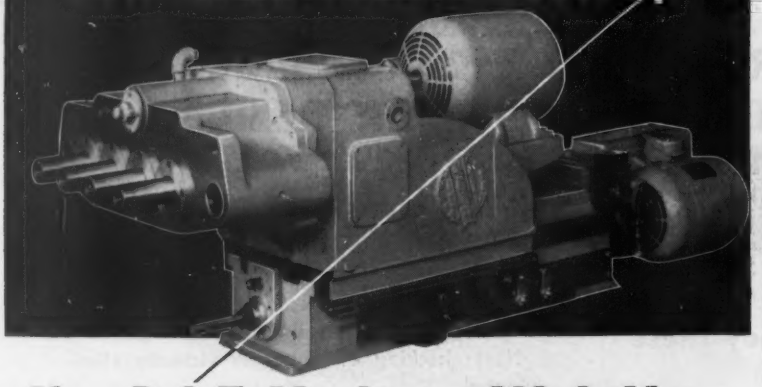
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

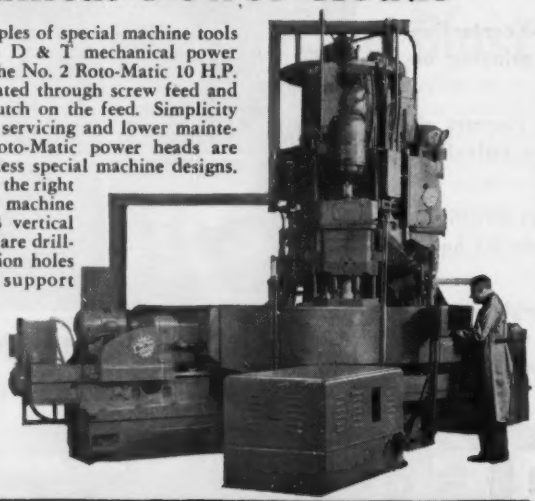
(*Continued on page* 340)

For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.

DAVIS and THOMPSON Roto-Matic

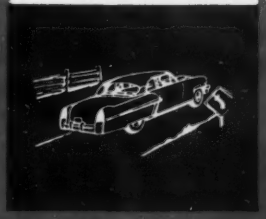
Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

For more information on products advertised, use Inquiry Card, page 243



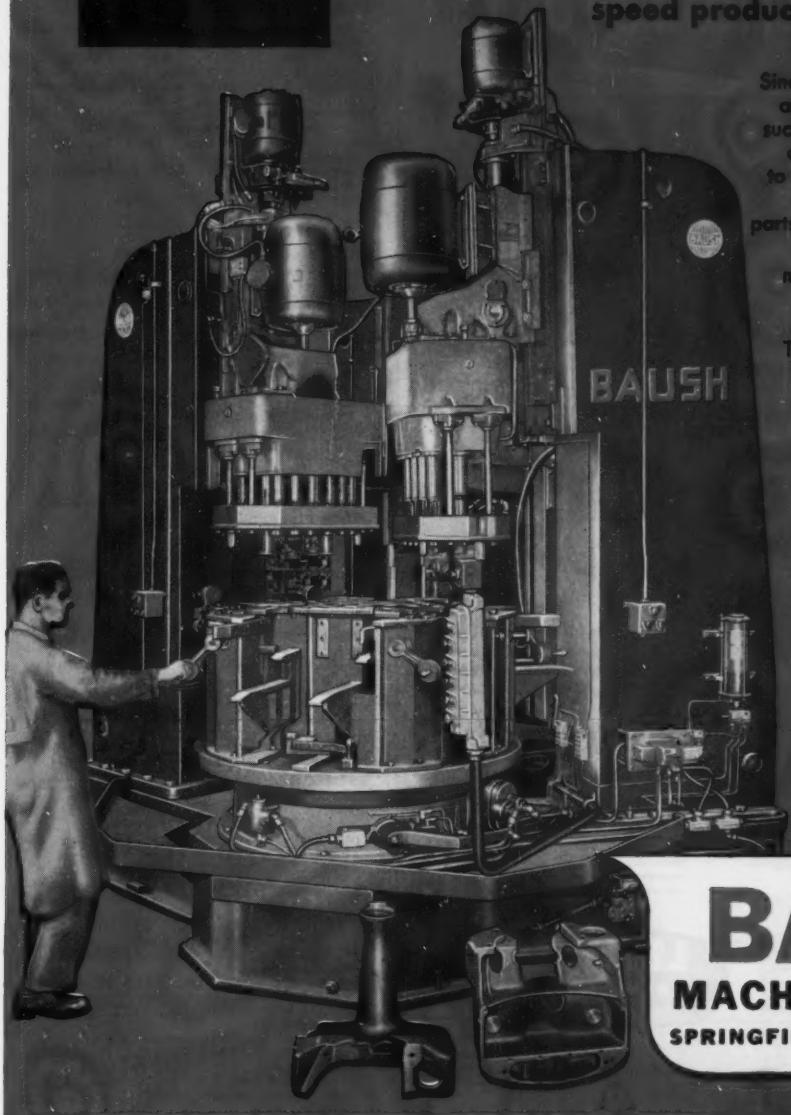




Whether -

TRACTORS
PLANES
or AUTOS---

Baush Automatic Machine Tools speed production and lower costs!!



Since their beginning the tractor, plane and automotive industries, which play such an important role in our modern-day life, have depended upon Baush to design and produce special purpose equipment to produce their machine parts better, faster and with less expense.

Whatever your machining problems might be our engineers can help you. Why not send us your prints and specification requirements TODAY?

This Baush Dual Column Unit machine is equipped with a 50" diameter semi-automatic hydraulic rotary table with 3 stations, 3 holding fixtures, automatic lubrication and J.I.C. Controls.

There are two 7½ mechanical lead-screw units, one 14-spindle fixed center head, and one 12-spindle fixed center head.

Part being machined is a Tractor Pedestal.

OPERATIONS: drilling, chamfering, reaming and spotfacing.

PRODUCTION — 33 pedestals per hour at 80% efficiency or a total of 858 operations per hour.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Drill

Blake, Edward Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

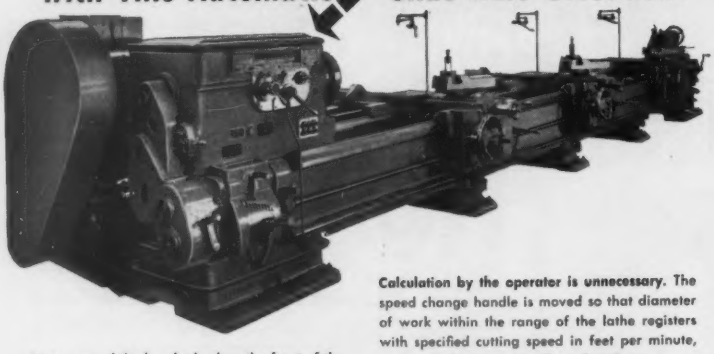
GRINDING MACHINES For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

(*Continued on page* 342)

THE BIG HYDRATROL STORY:

16 Spindle Speeds with only a Twist of the Wrist... with This Automatic Slide Rule Selection!



Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The speed change handle is moved so that diameter of work within the range of the lathe registers with specified cutting speed in feet per minute, and the lathe automatically makes the necessary change.

The rotary selector gives 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.

Check These Other Important Advantages:

- **Safe in operation.**
- **Simplicity in construction and operation.**
- **Hydraulic friction clutches and hydraulic brakes, self-compensating.**
- **Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.**
- **Spindle release for chucking.**
- **Perfect, safety-control lubrication with filtered oil.**
- **Gears constantly in mesh.**

Write today for additional information or catalog—or—send prints for time-and-money-saving recommendation!

LEHMANN MACHINE COMPANY
GRAND at CHOUTEAU • ST. LOUIS 3, MO.

DIVISION OF NOVO ENGINE CO.

For more information on products advertised, use Inquiry Card, page 243

LOOK CLOSELY AT THIS PICTURE
OF GRINDER PRODUCTION AND SEE WHY...

14 *is a lucky number*

for a manufacturer requiring precision grinding



ALL Thompsons operated continuously with much LESS DOWNTIME

that's why

it will pay you to invest in

Thompson Grinders

After twelve years continuous manufacture of precision ground products, ten Thompson Surface Grinders proved so efficient and economical that this manufacturer ordered four more machines.

Thompson Grinders are available in a wide range of types and sizes from 6" x 18" to 72" x 384" to meet all production, special or tool room grinding requirements. The Thompson line includes machines from giant Hydrial Way Grinders to automatic Truform Jet Blade Contour Grinders, Dual Rotary Grinders and Broach Grinders.

CONTACT THOMPSON TODAY FOR HELP WITH YOUR MACHINING PROBLEMS

THE THOMPSON GRINDER COMPANY
Springfield, Ohio

Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

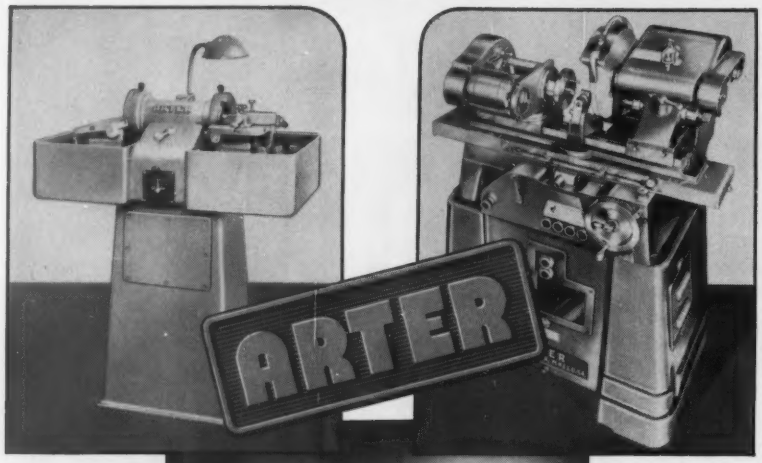
GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Walker, O. S., Co., Inc., Worcester Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

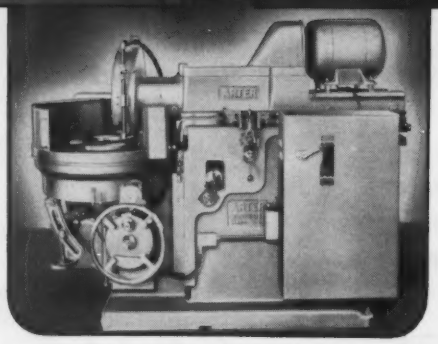
GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Wicaco Machine Corp., Stenton Ave. and Louaen St., Philadelphia, Pa.

The Arter Family of Machines



CARBIDE TOOL GRINDERS



CYLINDRICAL GRINDERS

INTERNAL GRINDERS

ROTARY SURFACE GRINDERS

Chuck Capacity 8" to 40"

The Arter trademark on these machines is the sign of
ACCURACY • POWER • DEPENDABILITY.
Tell our engineers your grinding problems.
They'll find a way to lick them.

ARTER GRINDING MACHINE COMPANY
WORCESTER • MASSACHUSETTS

Agents in industrial centers of United States and Canada

GRINDING MACHINES, Jig

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radial

Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Radius, Link

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Blanchard Machine Co., 64 State St., Cambridge, Mass.

(*Continued on page* 344)

For more information on products advertised, use Inquiry Card, page 243

Brutes for Strength



1 ***Greatest Shock Absorbing Capacity*** of any type single-row bearing. Here's the secret: Norma-Hoffmann Precision Roller Bearings provide full line contact between rollers and races. That means you get, size for size, a maximum area to support shock load.

2 ***Handles Up to 50% Overload*** Full line contact, the design feature of these bearings, also provides ample margin for severe temporary overloads.

3 ***Lowest Coefficient of Friction*** under heavy load of any type bearing, plus unsurpassed speedability. These important benefits are a result of Norma-Hoffmann's 100% machined bronze retainer, precision workmanship and short, parallel roller design.

When the going is so tough no other anti-friction bearing will stand up—use Norma-Hoffmann Precision Roller Bearings. You will continue to get dependable service under critically severe conditions of speed, load, shock and vibration. These bearings are precision-made to unusually exacting tolerances and are backed by years and years of proved performance. Norma-Hoffmann Bearings Corporation, Stamford, Conn.

"NORMA-HOFFMANN"

Precision Ball, Roller and Thrust Bearings

NORMA-HOFFMANN BEARINGS CORPORATION, Stamford, Connecticut — Founded in 1911
FIELD OFFICES: Chicago • Cincinnati • Cleveland • Dallas • Detroit • Kansas City • Los Angeles • San Francisco • Seattle

Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Gollmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Walker, O. S., Co., Inc., Worcester Mass.

GRINDING MACHINES, Tap

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

GROOVE PINS

Gillen, John, Co. Inc., 2540 S. 50th Ave. Cicero 50, Ill.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 200 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

(*Continued on page* 346)



Procunier Tappers provide almost automatic tap protection . . . . .

Breaking an excessive amount of taps in high speed tapping jobs is not a necessary evil! You definitely can minimize tap breakage, increase the efficiency of your operators and improve work quality on close tolerance work. Procunier tapping heads have been doing "just that" on hundreds of tapping operations! Perfect "finger-tip" sensitivity is one of the "control" factors behind the exacting productive power of these remarkable Tappers. They are engineered to supply many extra hours of continuous, accurate tapping without frequent "down-time" interruptions. They produce more pieces per hour—with fewer rejections, fewer spoiled pieces and a minimum of broken taps.

Here are just a few of the many remarkable mechanical improvements that only Procunier Tappers possess: new double cone, cork faced friction clutch assures "finger-tip" operation; soft "cushioned" driving and reversing pressure means longer tap life and greater sensitivity; ball bearing equipped for extra rigidity; heat treated gears reduce wear during high speed operations; special 3 point balanced gear reversing mechanism eliminates strain and tortion; smaller —lighter, more accurate tru-grip tap holder; and many others.



NEW "TRU-GRIP" TAP HOLDER

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.



Send for FREE Catalog . . .

giving full particulars on the complete line of Procunier Tapping Machines. Learn how you, too, can stop excessive tap breakage.

PROCUNIER Safety Chuck Company
16 S. Clinton St. Chicago 6, Ill.

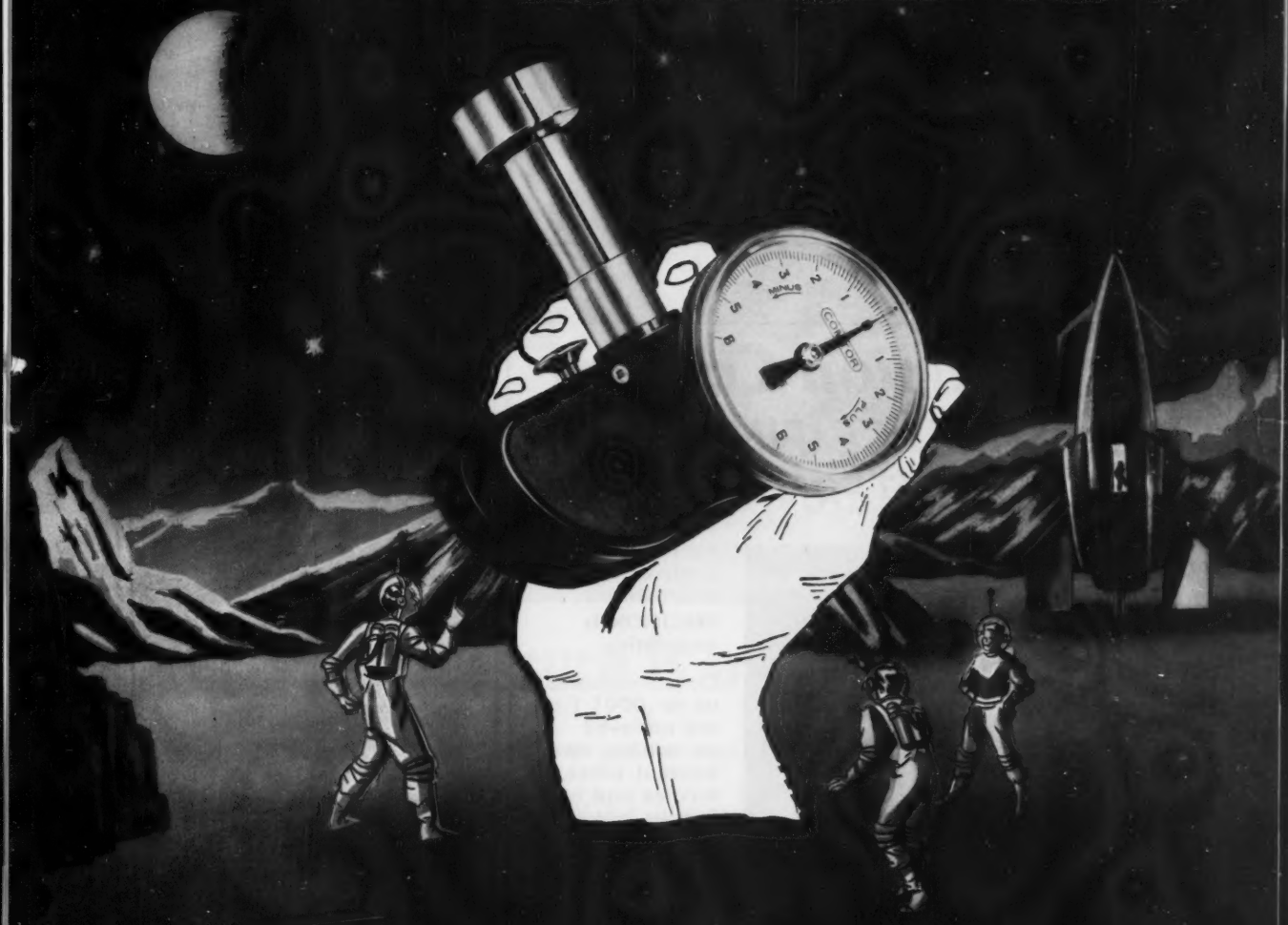
PROCUNIER SAFETY CHUCK CO.
16 S. Clinton St., Chicago 6, Ill. Dept. 10

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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Address .....
City ..... Zone ... State .....

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"PACKAGED PRECISION"

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F. D. Huntington Co.
9101 East Jefferson Ave.
Detroit 14, Michigan

Proctor & Martin Co., Inc.
262 Franklin Street
Boston, Mass.

Harold E. Sundberg
Ellicott Square
Buffalo 3, New York

Conant Screech Company
347 West 107th Street
Chicago 28, Illinois

Delph Boettler Company
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St. Louis 5, Missouri

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Berkeley, California

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Walter R. Ott
386 Abingdon Road
Dayton 9, Ohio

Severance Tools of Canada, Ltd.
1232 Eglinton Avenue West
Toronto, Ontario

Gerhart M. Cosby
4756 East Olympic Blvd.
Los Angeles 22, California

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Gleason Works, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Gleason Works, 1000 University Ave., Rochester, N. Y.

HARDNESS TESTING INSTRUMENTS
Olsen, Tinius, Testing Mch. Co., Philadelphia, Pa.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HOBBING MACHINES
See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS
Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HOISTS, Chain, Etc.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric
Philadelphia Gear Works Inc., Erie Ave. and G St., Philadelphia, Pa.

HONING MACHINES, External
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Synder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

HONING STONES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

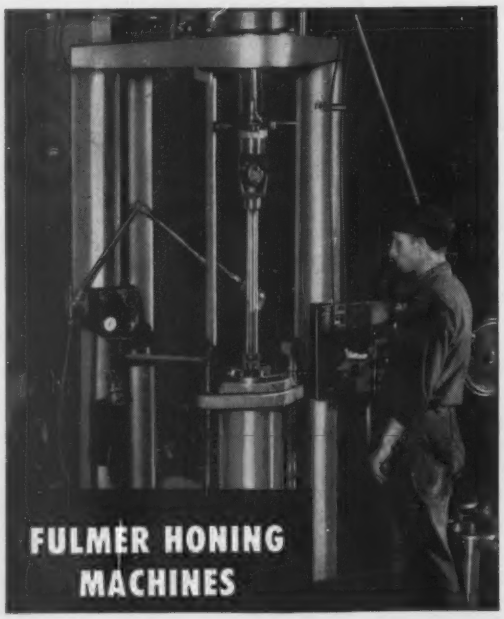
HONING TOOLS AND FIXTURES
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HOSE, Leather, Rubber, Metallic, Etc.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.

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Tools and equipment
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.

(*Continued on page* 348)

For Precision Control
OVER SURFACE FINISHING OF INTERNAL BORES



"HIT OR MISS" methods just won't work . . . PRECISION is imperative.

Close tolerances up to .0001 (±) are achieved by cutting away internal bores in ferrous and non-ferrous metals, glass, plastic and other materials.

Quick . . . economical . . . mathematically accurate.

for cylinder blocks, connecting rods, blind end cylinders, hydraulic cylinders, 4-way valves, gears, etc.

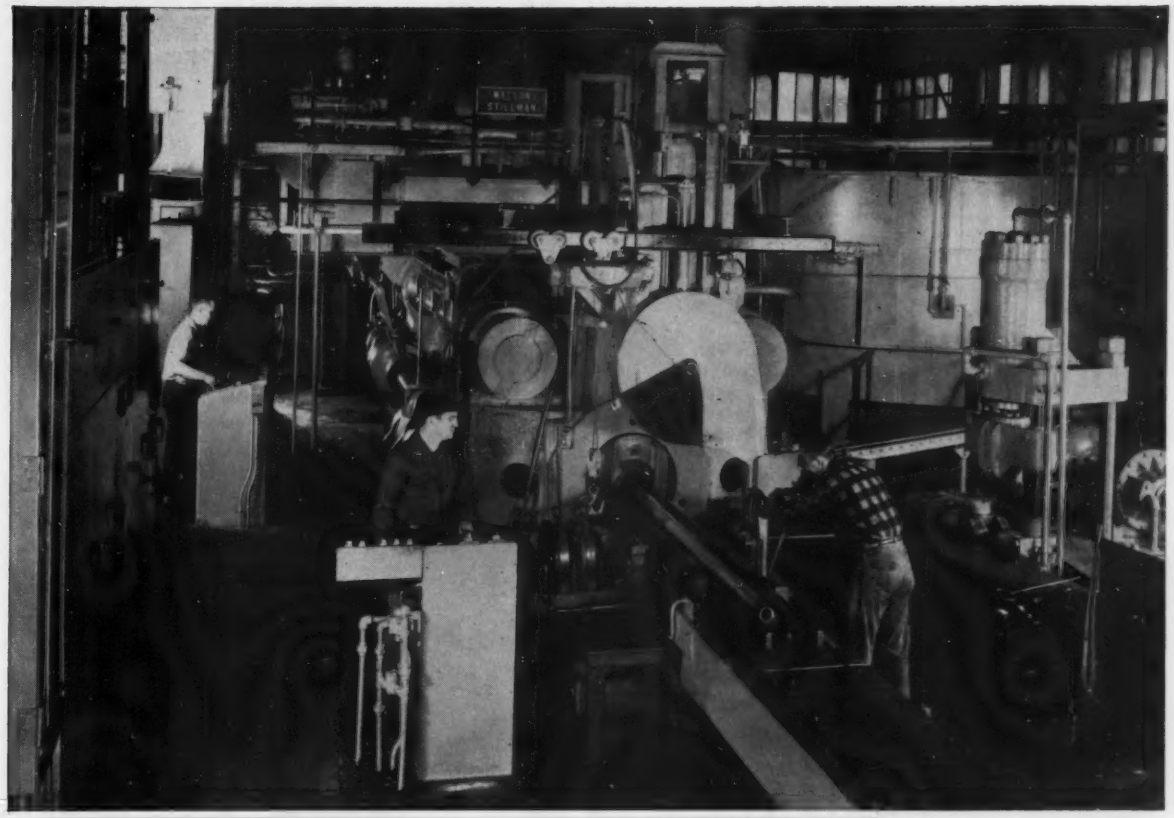
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C. ALLEN FULMER CO.

1231 First National Bank Bldg. Cincinnati 2, Oh'o

WRITE for our bulletin on honing.

For more information on products advertised, use Inquiry Card, page 243



When the Pressure is on *Quality...*

W-S "COMPLETELINE" of EXTRUSION PRESSES

- Aluminum
- Brass
- Bronze
- Carbon
- Ceramics
- Copper
- Cordite
- Crayon
- Graphite
- Lead
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- Magnesium
- Phosphor Bronze
- Silver Alloys
- Solder
- Steel
- Welding Rod
- Wire

W-S HYDRAULIC

Watson-Stillman hydraulic extrusion presses are top producers.

At the American Brass Company's Waterbury tube mill a recently installed Watson-Stillman 2300 ton extrusion press has greatly increased the production of tube stock. The press, pictured above, is extruding billets up to 10" in diameter to produce tube blanks up to 6⅝" O.D. weighing up to 350 pounds. The press will extrude over 30 copper base alloys.

Consult Watson-Stillman on your next extrusion press problem. The Watson-Stillman "Completeline" of hydraulic extrusion presses ranging in capacities from 30 to 5000 tons is designed to meet every production requirement.

THE WATSON-STILLMAN COMPANY
DIVISION OF H. K. PORTER COMPANY, INC.
161 Aldene Rd., Roselle, New Jersey



...a handful of lost tolerances

Would you buy cutting oil containing this kind of "gooey" mess—and expect to hold close tolerances and keep production at its peak? Obviously no, yet users of Sharples oil purifiers in one day, remove many times this amount of abrasive particles, water, and just plain dirt from the average machine tool sump in the average plant.

These same users no longer have to fight against these impurities to keep workmanship high and costs low. A Sharples oil purifier keeps cutting, grinding, honing, quenching, and test oils always clean—and it pays off in many ways: less oil replacement, fewer rejects, longer tool life, closer tolerances and better finish. The Sharples purifier takes only ten minutes to clean, and requires practically no maintenance.

If your shop is producing good work in spite of dirty cutting oil, it will pay you to take a good look at the extra savings and extra earnings that a Sharples oil purifier makes possible year in and year out.

ALL OTHER THINGS BEING EQUAL...
(Machines—Tools—Operators)

...work produced with cleaned cutting oils costs less to obtain desired tolerances, and is run at significantly higher speeds. Even some very small shops find it profitable to be sure of clean cutting oil at all times.

Sharples Bulletin 1270 will be sent upon request.



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THE SHARPLES CORPORATION
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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
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Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
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Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

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Barnes W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc. 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

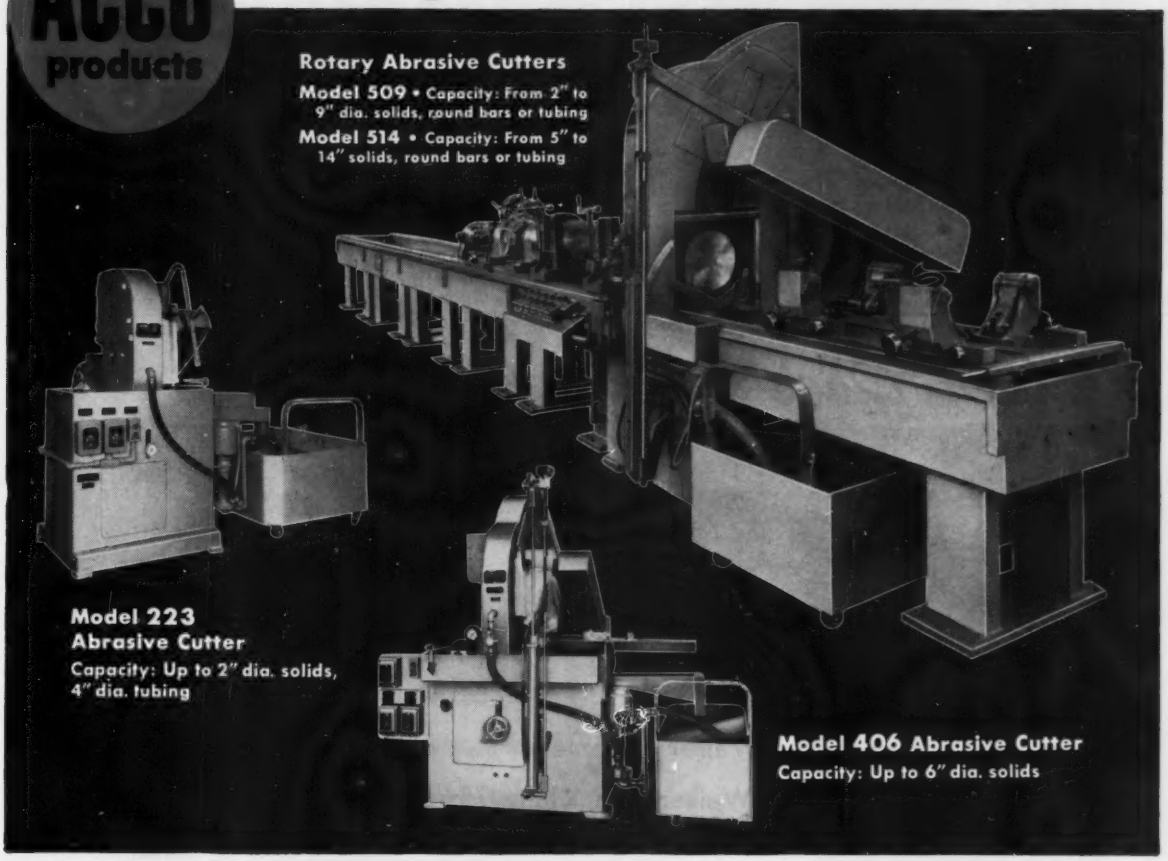
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

(*Continued on page* 350)

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Campbell Abrasive Cutters

ACCO products



Quick cut-offs save you money—here's how . . .

By rapidly cutting stock that takes much longer by other cutting methods, CAMPBELL Abrasive Cutters reduce your labor costs and the number of machines required. They make quality cuts on alloy and high carbon steels. Close tolerances, smooth finish and straight cuts can be made, resulting in large savings of material. Cuts all types of stock without hardening and with minimum of burr.

It will pay you to remember these CAMPBELL features:

1. Superior Sales Engineering Service
CAMPBELL engineers, experienced in every type of cutting problem, are available for consultation on YOUR cutting problems.

2. Economy and Speed of Operation
CAMPBELL Abrasive Cutters are built to do every type of cutting job with the utmost accuracy, efficiency and economy. Cuts are smooth and practically burr free.

3. Complete Line of Standard Machines
CAMPBELL Abrasive Cutters are available in the widest variety of styles and models. They are fully automatic and semi-automatic. Have many exclusive features.

Consultation with trained CAMPBELL engineers will cost you nothing. Let them show you how the addition, or substitution, of the right abrasive cutter can increase your output per man-hour. It could be the most profitable move you ever made.

Write today for Bulletin DH-301 on Campbell Abrasive Cutting Method

ACCO

Campbell Machine Division
AMERICAN CHAIN & CABLE

925 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

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Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co. Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

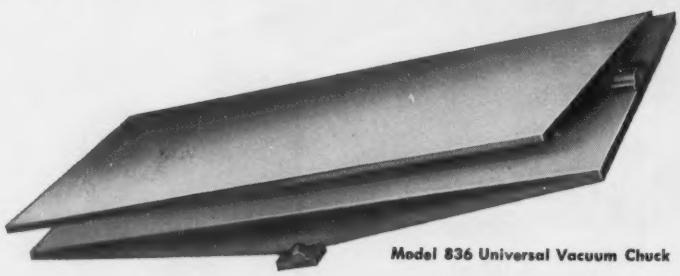
JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

JIG BORER

See Boring Machines, Jig.

Walker Does It Again-



Model 836 Universal Vacuum Chuck

The evolution of a satisfied Walker customer:

1. Problem submitted to Walker technicians (75 years' leadership in special designs for chucks).
2. Theoretical research and discussion. (Walker engineers are scientifically trained and are specialists).
3. Practical working models. (Walker engineers and shop men make actual to scale working models). Here is where the application of true scientific principles is utilized.
4. Customer proposal based upon years of experience and a combination of engineering study and practicability.
5. Conclusion: Another Satisfied Walker Customer.

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Chucks: Rectangular, Swiveling, Rotary, Vacuum, Special Types . . . Demagnetizers . . . Planer Parallels.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co.. Inc., 810 Center Ave., Logansport, Ind.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

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Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

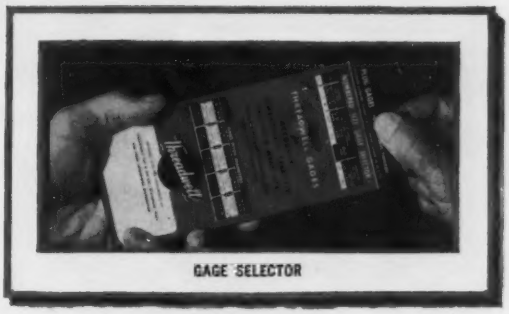
LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.

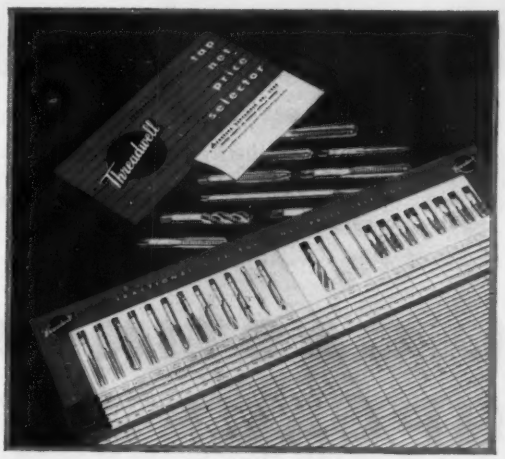
(*Continued on page 354*)

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selected for service



GAGE SELECTOR



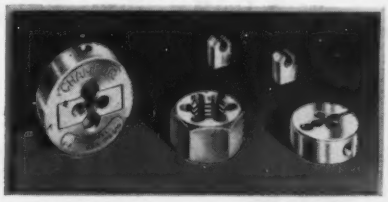
NET PRICE SELECTORS

For the convenience of cutting tool and fixed gage users and buyers Threadwell presents two more services for more efficient and economical production:

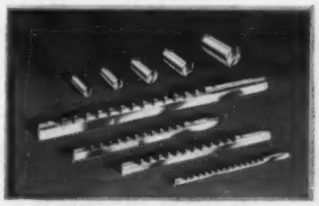
NEW THREAD GAGE SELECTOR—a complete pocket-size tabulation of basic data for thread plug and ring gages, both fractional and numbered sizes from No. 0 to 1½".

NEW NET PRICE SELECTORS—provide quick data on all standard taps, dies, tap and die kits, counterbores and keyway broaches; simply pick the size and style wanted and get the net price instantly.

Ask your Threadwell distributor for these two new members of the Threadwell service family. Ask him too about the long service life of Threadwell's fine cutting tools and gages.



ADJUSTABLE ROUND, 2-PIECE & HEXAGON DIES



KEYWAY BROACHES & SETS

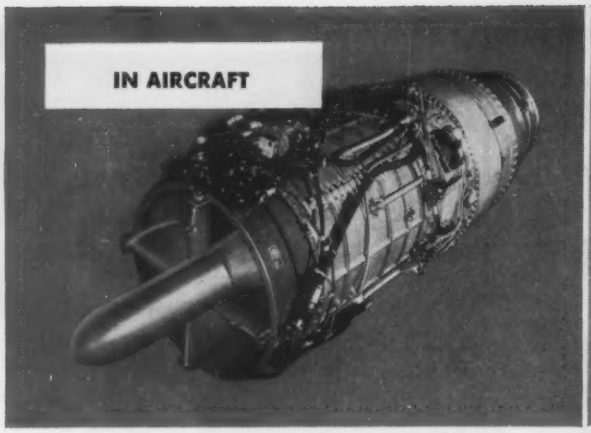


COMPLETE LINE OF HIGHEST PRECISION GAGES

THREADWELL DISTRIBUTORS, too, are strategically located to serve you promptly, properly, and well.

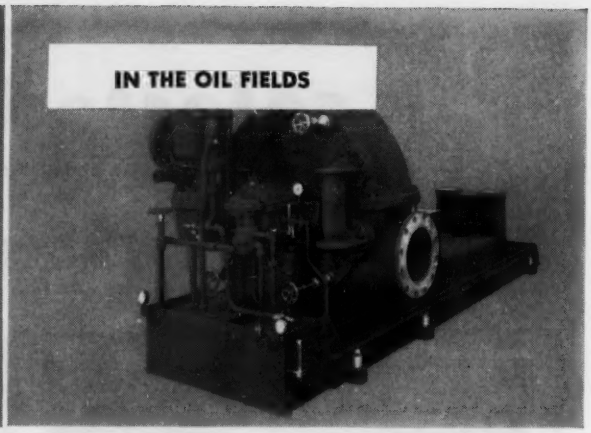


THE FINEST IN CUTTING TOOLS & GAGES



AHEAD OF THE VAPOR TRAIL . . .

CIRCLE Ⓛ Stainless Steel Castings, used for turbine shrouds, heat shield supports and other important parts of turbo-jet engines, withstand temperatures of approximately 1500° F.



IN GIANT NATURAL GAS TURBINES . . .

CIRCLE Ⓛ Stainless Steel Castings were selected to withstand the terrific heat and pressures needed in powering heavy-duty oil pumps delivering thousands of barrels of oil a day.

UNIQUE STEEL CASTINGS ARE COMMONPLACE AT LEBANON



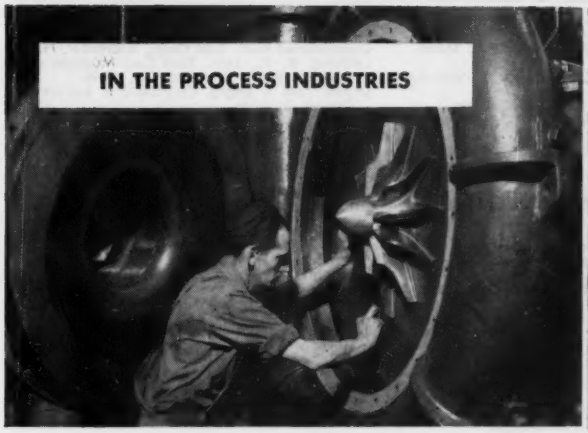
THE HEART OF GIANT TUBE REDUCING MACHINES . . .

CIRCLE Ⓛ Steel Castings are at work in immense oil hydraulic high-pressure pumps . . . operating efficiently at pressures up to 3,000 p.s.i. in huge tube reducing machinery.



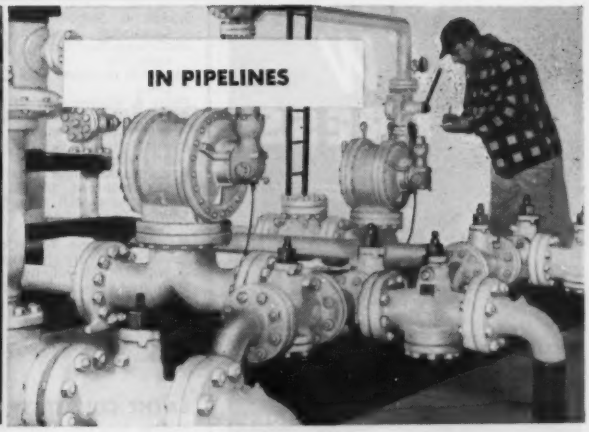
IN NEW SHELL MOLDING PROCESS . . .

Lebanon Steel Foundry research is continually developing new processes to improve the performance and economy of CIRCLE Ⓛ Castings. Such research has led to the use of the shell molding process to meet certain customer specifications.



AT THE CENTER OF A MINIATURE TORNADO . . .

CIRCLE Ⓛ Steel Castings for the one-piece, open type, radial bladed impellers are the "tornado blowers" in single-stage centrifugal blowers that are widely used in the process industries.



COUNTING THROUGHPUT OF THESE LIFELINES . . .

CIRCLE Ⓛ Steel Castings form valve bodies for the huge meters that count the billions of barrels of oil flowing through many of the country's pipelines.

Whatever the specification . . . whatever the size . . . from castings weighing only a few ounces to giants of several tons . . . Lebanon Steel Foundry CIRCLE Ⓛ Castings are made to the highest standards of excellence.

CIRCLE Ⓛ CASTINGS CIRCLE THE GLOBE!

NEW LEBANON BROCHURE



Lebanon Steel Foundry has just released a 32-page technical brochure on the operations and technical facilities available. Send today for your copy of this interesting, fully illustrated Lebanon CIRCLE Ⓛ brochure.

Lebanon Steel Foundry
60 Lehman St., Lebanon, Pa.
Please send me a copy of your new *Technical Brochure*.

Name .....
Title .....
Company .....
Address .....

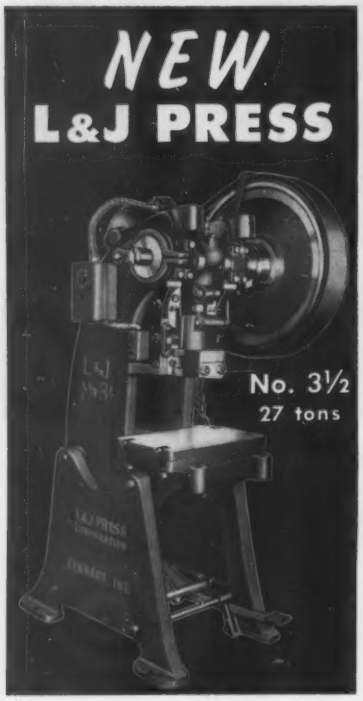
CARBON, LOW ALLOY AND STAINLESS STEEL CASTINGS

LEBANON

STEEL FOUNDRY

LEBANON
PENNSYLVANIA

CIRCLE L ®
T.M. REG.



A new ruggedly built press with the capacity, rigidity and accuracy for a wide variety of precision work. It has the time-tested L&J features that give you more value for your money through better and more efficient press work.

SPECIFICATIONS

Strokes per minute	120
Ram stroke, standard	2½"
max. stroke (to order)	4"
Ram overhang, center of ram to frame	6¾"
Die space, standard*	8¼"
special,* up to	12¼"
Bolster plate area	21½" x 13"
Opening through back	10"

* bed to ram, stroke down, adjustment up

Let our local distributor show you the benefits of putting L&J Presses to work for you. 17 O.B.I. models—flywheel and backgear types—6 to 80 ton capacities. All available with L&J—Fawick Air Clutches for high-speed production.

Write for literature

L&J PRESS CORPORATION
1631 STERLING AVENUE
ELKHART, INDIANA

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg Co., Hutchinson, Kansas.

LATHES, Automatic

Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Casa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Machinery Co., Inc., 383 Lafayette St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

(*Continued on page* 356)

the best running mate your product can have–

DELCO MOTORS

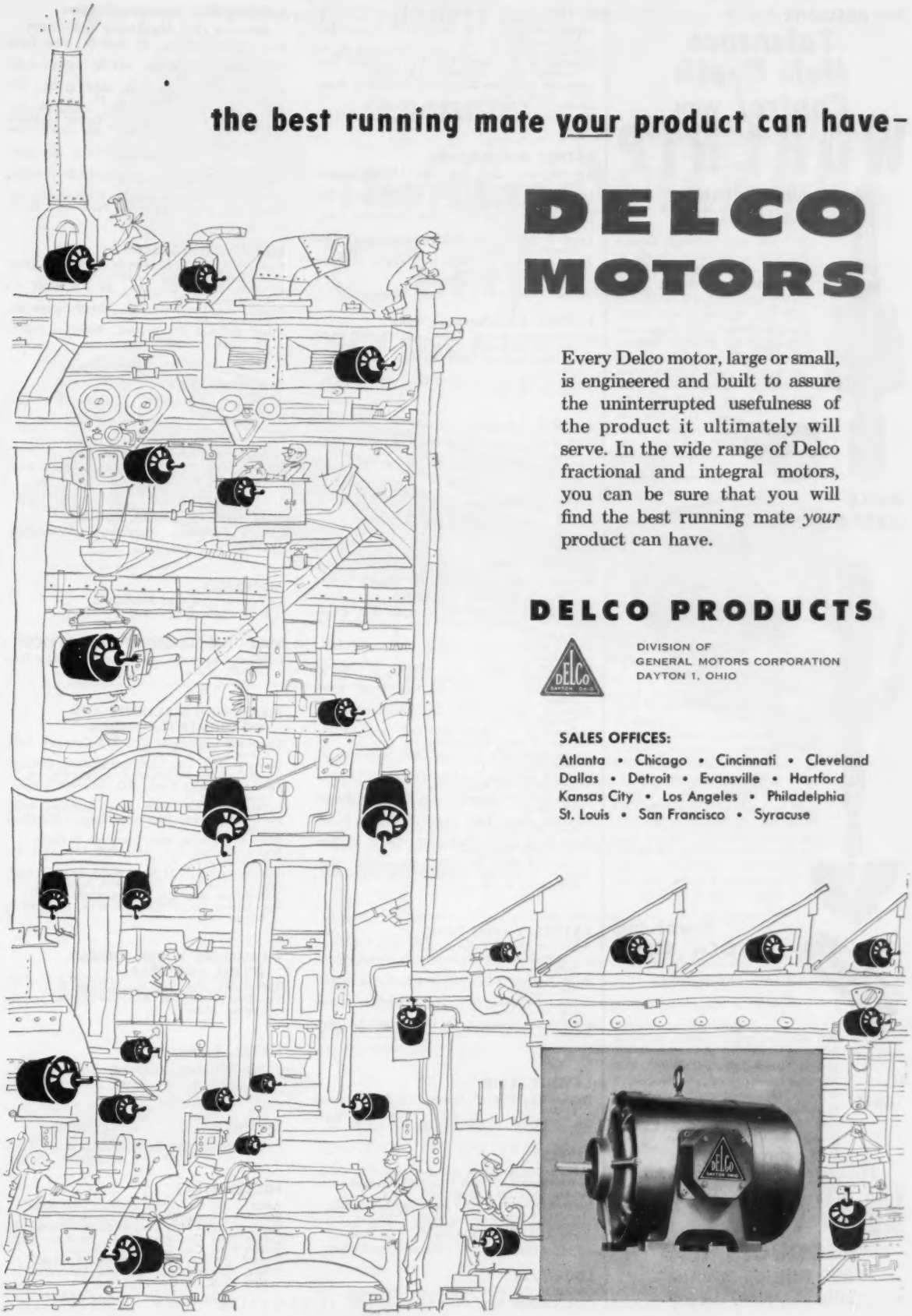
Every Delco motor, large or small, is engineered and built to assure the uninterrupted usefulness of the product it ultimately will serve. In the wide range of Delco fractional and integral motors, you can be sure that you will find the best running mate *your* product can have.

DELCO PRODUCTS

DIVISION OF
GENERAL MOTORS CORPORATION
DAYTON 1, OHIO

SALES OFFICES:

Atlanta • Chicago • Cincinnati • Cleveland
Dallas • Detroit • Evansville • Hartford
Kansas City • Los Angeles • Philadelphia
St. Louis • San Francisco • Syracuse



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GET ABSOLUTE
Tolerance Hole Depth Control WITH
WOHLNIP



Non-Rotating DRILL STOPS

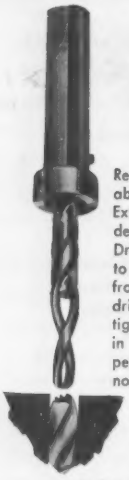
Will not mar, mark or damage the face of the work, fixture or bushing, yet give POSITIVE CONTROL OF HOLE DEPTH. Completely automatic, the WOHLNIP Drill Stop reduces human errors, simplifies difficult jobs, lowers machining cost, increases production, and eliminates rejects. Used for drilling, center drilling, countersinking, boring, milling, routing, reaming. Available with straight or taper shank, for any size drill or tool.



(Patent Pending)

DRILL EXTRACTORS





Reduce down time, salvage valuable parts with the WOHLNIP Drill Extractor. Built for many years of dependable service, the WOHLNIP Drill Extractor is furnished complete to handle all standard broken drills from 1/8" to 1/2"—a total of 168 drills. A broken drill, "frozen" tight in the hole, is easily removed in a few minutes, even by inexperienced operators. Set-up does not have to be removed. No special machines or tools needed; everything is in the handy kit shown. (Patent Pending)



Revolving STOCK STOPS

3 Interchangeable Noses

HAS WHAT IT TAKES

Get positive length control; eliminate whipping or marring of stock ends; get greater production uniformity. Will stand up under hard use because it is made of highest quality materials, hardened and ground. It is highly impact resistant. Available with interchangeable V-Centering, Flat, or Ball Point nose pieces.

EXCLUSIVE DISTRIBUTORS WANTED

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PRODUCTS, INC
390 Hillside Avenue
Hillside, New Jersey

LATHES, Gun
Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Springfield Machine Tool Co., Springfield, Ohio.

LATHES, Hollow Spindle
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom
See Lathes, Engine and Toolroom.

LATHES, Turret
Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Morey Machinery Co., Inc., 383 Lafayette St., New York, N. Y.
Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Rogers Machine Works, Inc., Buffalo 10, N. Y.

LAYOUT FLUID
Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LOCKNUTS
Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme pressure (EP) Machinery Lubricants
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

LUBRICATING SYSTEMS
Farval Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINE KEYS
Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.

MACHINE PARTS, Special
Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.

MACHINISTS' SMALL TOOLS
See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDRELS
See Arbors and Mandrels.

MARKING MACHINES AND DEVICES
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Crane Parking Co., 1800 Cuyler Ave., Chicago.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings
See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS
See Recording instruments.

MICROMETERS
Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

(*Continued on page* 358)

For more information on products advertised, use Inquiry Card, page 243

We put Hydraulic Cylinders on a reducing diet



RESULT:

The New VICKERS® "Compact" HYDRAULIC CYLINDERS

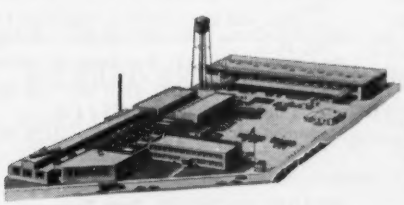


For 2000 PSI Working Pressure

Everybody agreed that hydraulic cylinders were just too fat . . . took up too much space. So our engineers put them on a reducing diet. The result . . . these slim, powerful, "Compact" cylinders fit and work in spaces where the old type could not. It is part of Vickers long-time program of continuous improvement.

Among their many other features are: Multiple port positions. Spring-loaded synthetic-impregnated leather rod seal compensates for wear, assures long service. Piston seals are improved cup type. Tie rods are high tensile alloy steel. Adjustable integral hydraulic cushions are available. Comply with JIC standards. Conservatively rated for maximum working pressure of 2,000 psi. For further information, see Bulletin 54-68.

Waterbury Tool Division of Vickers Incorporated where "Compact" Cylinders are manufactured.



Ask for New Bulletin 54-68

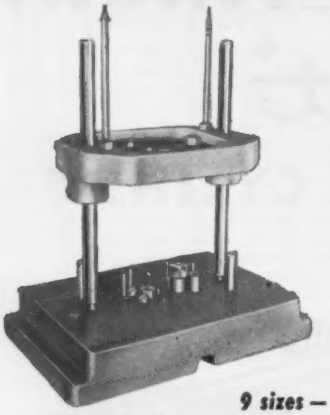
VICKERS Incorporated
DIVISION OF SPERRY CORPORATION
OAKMAN BLVD. • DETROIT 32, MICH.

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6950

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

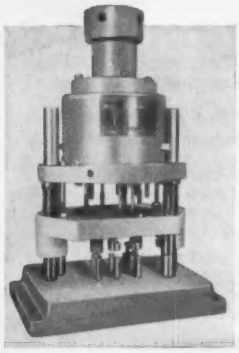
Zagar Self-clamping
DRILL JIGS
NOW STANDARDIZED for DRILLING, REAMING, TAPPING



9 sizes — 5 combinations per size — for hole patterns 3" through 15" dia.

Standardization makes for quick delivery and attractive price. Only a few minor parts need be made. Speed up machining operations. The operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Zagar drill jigs are now "off the shelf".

♦ ♦ ♦



Zagar drill jigs can be used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill, and tap on standard drill presses and tapping machines. Or, Zagar can quickly supply the complete "package" unit.

♦ ♦ ♦

Write for new Bulletin "M-10"

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio.
Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Pratt & Whitney West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway. Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Van Norman Co., 3640 Main St., Springfield 7, Mass.

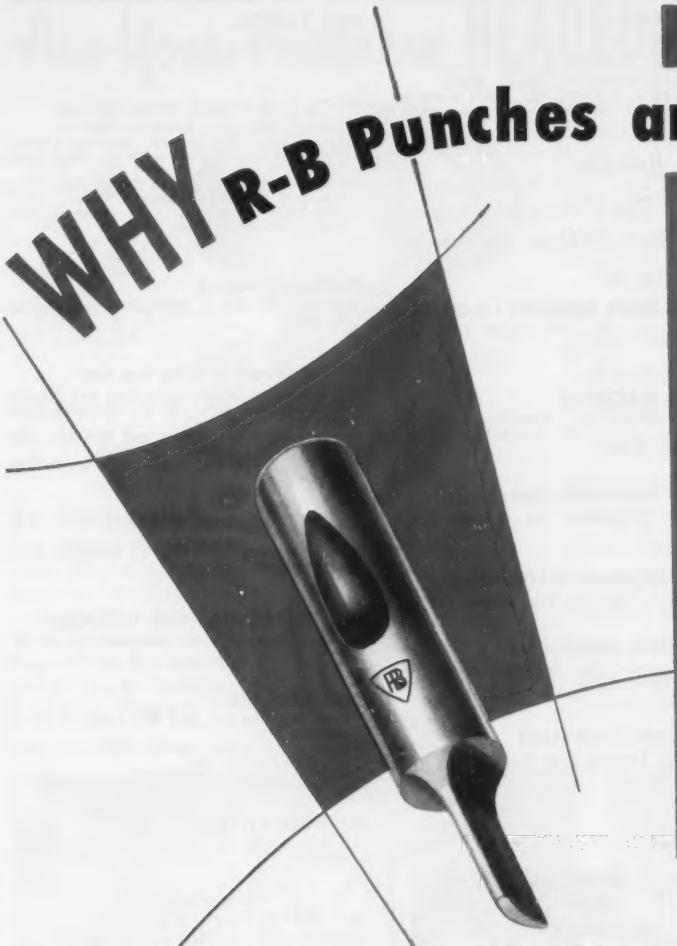
MILLING MACHINES, Turret Type

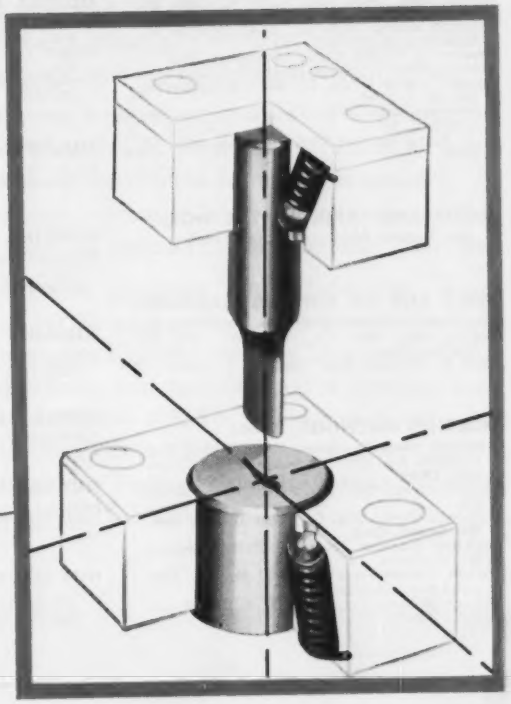
Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

(*Continued on page* 360)

For more information on products advertised, use Inquiry Card, page 243

WHY R-B Punches are easier to use

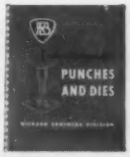




Just a push, a twist, and "click" your R-B punch or die button is accurately ALIGNED and LOCKED in place. The R-B ball lock prevents radial or vertical movement of the punch or die button in the retainer—no additional keying is required.

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Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. C., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27, Ohio.

MODEL AND EXPERIMENTAL WORK
See Special Machinery and Tools.

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Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric
Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Howell Electric Motor Co., Howell, Mich.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

MOTORS, Hydraulic
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES
Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

NIBBLING MACHINES, Nickel
International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT
See Screw Driving and Nut Setting Equipment.

NUT TAPPERS
See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap
Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking
Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL CUPS
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS
Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.
Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.

OILS, Cutting
See Cutting and Grinding Fluids.

OILS, Lubricating
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

(*Continued on page 362*)



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Only universal scroll chuck with .0005" precision—for lathes, grinders, dividing heads, screw machines.

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BUCK TOOL COMPANY
1020 SCHIPPERS LANE • KALAMAZOO, MICH.

For more information on these products, use Inquiry Card, page 243

Are Your Fasteners HEADED FOR TROUBLE?

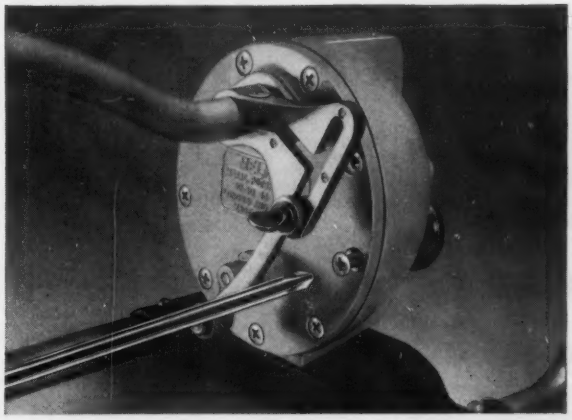


P-K STANDARDS protect you against these and many other symptoms of Screws "headed for trouble". They don't "get by" P-K inspectors—that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality".

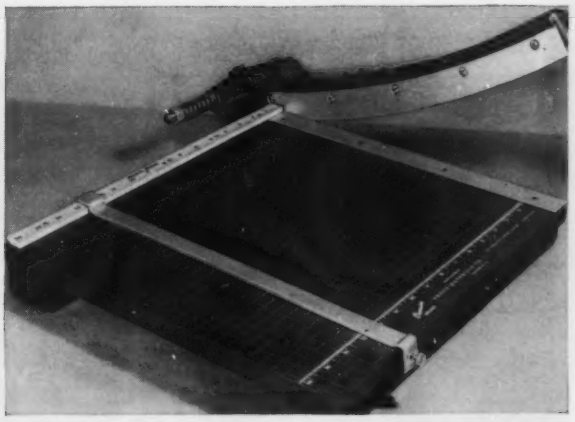
Screws are sometimes like people. If they "lose their heads" under pressure — if they turn out to be "softies" — if they don't "square up," they are headed for trouble.

The difference between screws made to P-K Standards and those that are "headed for trouble" is hard to see at a glance, but the effects of screw failure (parts spoilage, high reclamation expense, hidden weakness) are quickly evident in mounting assembly costs and customer complaints.

P-K Self-tapping Screws are "headed for savings" — not only headed, but threaded, pointed, and heat-treated with the same purpose — to keep your assembly lines trouble-free. That's why so many *more* manufacturers of America's best-known products specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer. Or write: Parker-Kalon Division, General American Transportation Corporation, 202 Varick St., New York 14.



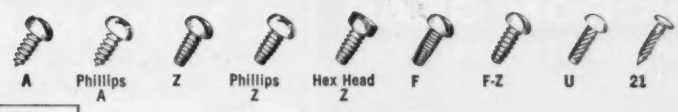
"SWINGIN' SPRAY," MELNOR Products Co.'s popular lawn sprinkler keeps on "swinging" because the oscillating mechanism is separate and sealed from the water intake system. To assure equally dependable assembly strength, resistant to the roughest handling, Melnor fastens zinc and aluminum parts with P-K Screws, 7 Phillips Head Type Z and 18 Type F, driven with air tools.



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Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
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Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Waston-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

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Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

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American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc. 230 Park Ave., New York, N. Y.

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Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

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Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
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Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

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Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

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Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, Ill.

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Black & Decker Mfg. Co., Penna. Ave., Towson, Md.
Gardner Machine Co., (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

(*Continued on page* 364)



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Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
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Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

PRESSES, Broaching

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Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

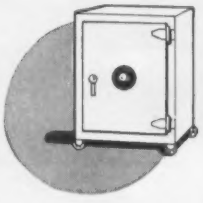
PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div., Oliver Corp., 142 North Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.

(*Continued on page* 366)



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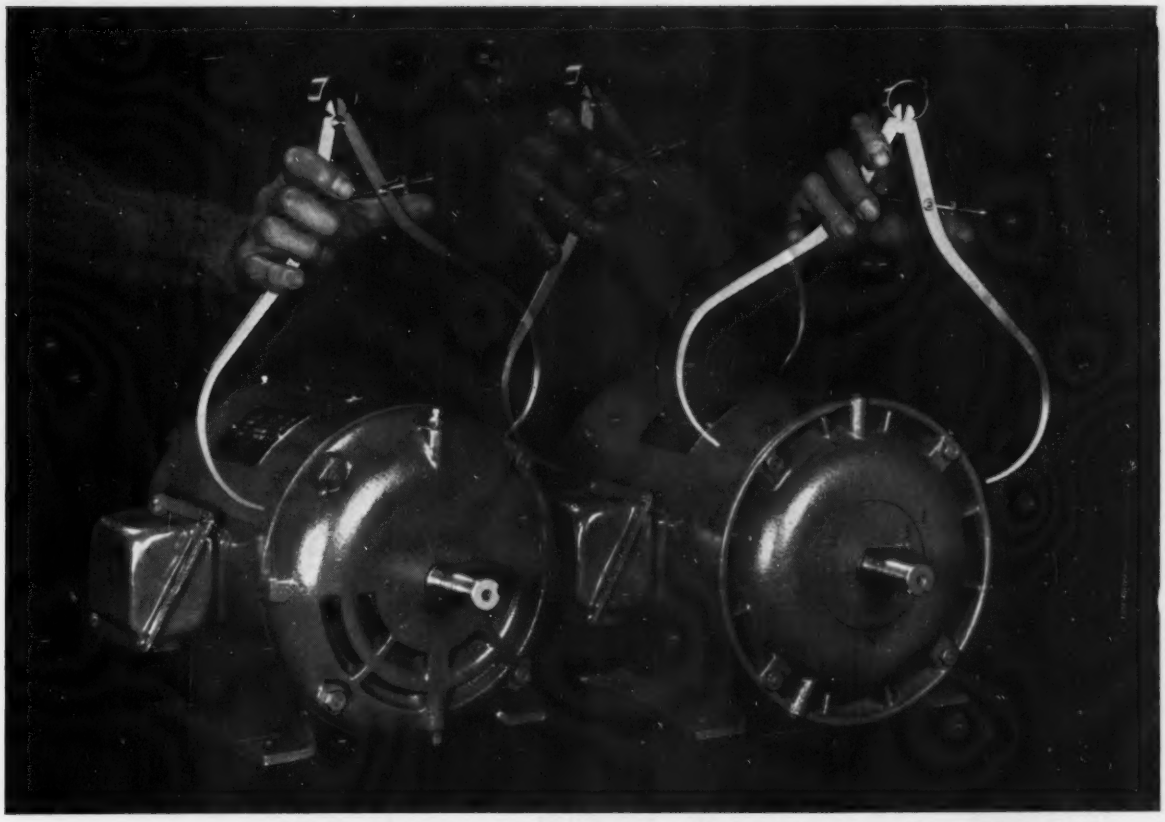
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Series 100 Open Motors are lighter in weight and take up to 30% less space than open motors of old NEMA frame sizes.

Series 100 TEFC Motors have same diameters as the Series 100 Open Motors, for easier interchangeability.

New Howell Series 100 open and TEFC motors have same diameters!

Howell's new re-rated motors save space, are easier to interchange! Feature double-shielded bearings . . . serve your needs better *all* ways.

If space ever limited your use of motors, here's welcome news: Series 100 Open and TEFC Motors have the same diameters! The reason? – Howell's exclusive ventilating system. This system cools *internally* providing 50% more contact between cooling air and active lamination materials. Result: you get motors that meet minimum space requirements . . . that run cooler than established ratings . . . that have increased load capacities – you get improved performance and longer life!

Less maintenance, too! New double-shielded bearings are standard on both the open and TEFC motors. These bearings seal grease in – dirt out. And where operating conditions are severe, you can re-grease them quickly, easily. Actual use proves these double-shielded bearings best for most applications; however, any type can be furnished.

Meet your special needs! New Series 100 Motors provide dependable copper rotors – three diameters for each frame size to assure design flexibility. Special corrosion-resistant materials and fittings are available.

Before you buy any re-rated motor, compare Howell's Series 100 Motors – for modern design, outstanding performance and precision engineering. Howell will continue to make a complete line of regular and special motors—with over 20,000 electrical design specifications to serve you. Call your Howell man today or write for Bulletin N-100!

HOWELL Red Band MOTORS

HOWELL MOTORS

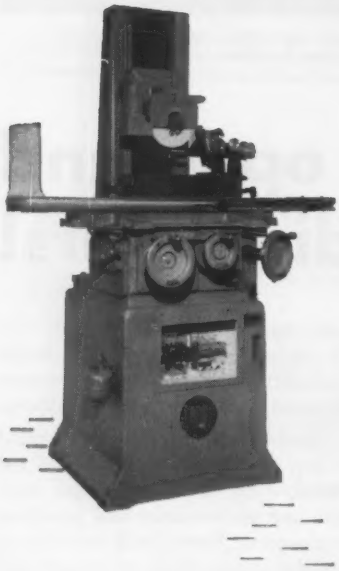
Howell Electric Motors Company, Howell, Michigan

MOTORS FOR INDUSTRY SINCE 1915



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He'll show you why modern Reid Grinders will increase efficiency in your toolroom.

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Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros., Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 142 North Duke St., York, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 213 Mill St., Arcade, N. Y.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp, 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Machinery Co., Inc., 383 Lafayette St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.

(*Continued on page* 368)

For more information on products advertised, use Inquiry Card, page 243

TAKE A LOOK AT YOUR TOOL CRIB

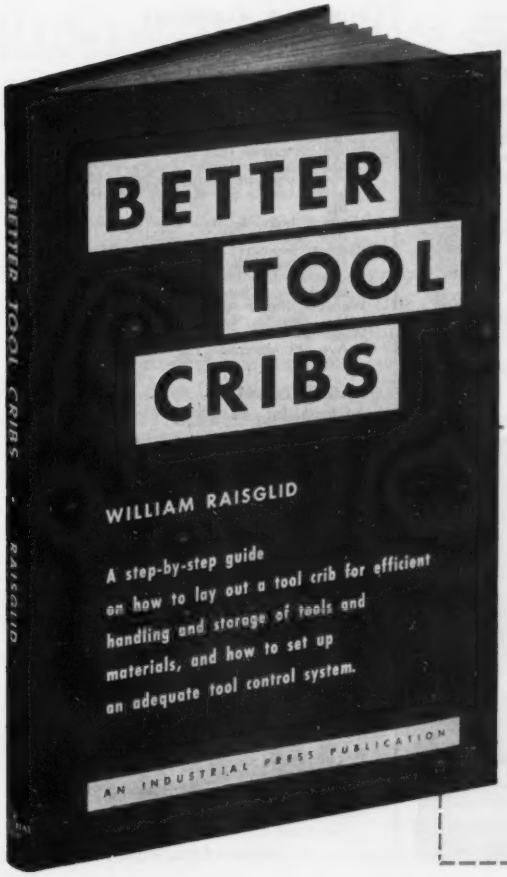
"Better Tool Cribs" shows how to:

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M-10/54



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Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary
Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES
See Dies, Sheet Metal, Etc.

PUNCHES, Centering
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY
Allen, Alva F., Box 426, Clinton, Mo.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Tool Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

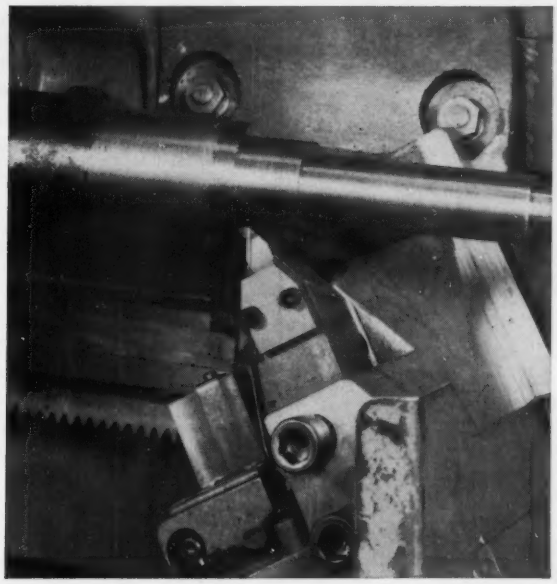
RACKS, Gear Cut
Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

(*Continued on page* 370)

For more information on products advertised, use Inquiry Card, page 243

. . . a performance report on another Kennametal grade with ideas you can use to cut machining costs



New Kennametal profiling tool, with clamped K4H grade insert, machining pinion gear blank on New Britain + GF + Copying Lathe. The Lathe's hydraulic system operates the copying slide and actuates several automatic functions.

100% increase in surface speed on New Britain +GF+ Copying Lathe with new Kennametal* K4H Profiling Tool

A series of tests were run to determine which tooling would best utilize the performance potential of this New Britain +GF+ Copying Lathe in profiling SAE 8720 steel pinion gear blanks.

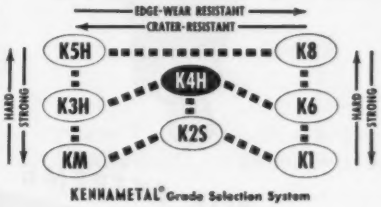
With K4H inserts clamped in new Kennametal PT Style Tools, these tough pinion forgings were profiled at 850 RPM. The machining time averaged 32 seconds, holding plus or minus 0.001 inch on all diameters. The depth of cut on each side was $\frac{3}{8}$ inch. An average of 220 pieces were machined per grind.

Prior to testing K4H inserts, the maximum lathe speed practical with standard brazed carbide tools was 425 RPM.

The 100 percent increase in surface speed made possible by the use of K4H inserts permitted fuller utilization of the capabilities of this new, versatile, high speed lathe. A20

*Registered Trademark

K4H is a hard grade with unusually high strength which makes it suitable for roughing scaly, abrasive steel castings and forgings where both edge-wear and crater resistance are required. Versatile K4H is also an excellent grade for interrupted cutting and, when used as a brazed tool, for a variety of finishing operations where the chip load is light.

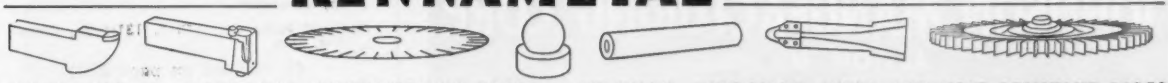


KENNAMETAL® Grade Selection System

The easy-to-use grade selection guide shows that K4H is harder than K2S—more crater resistant than K6—more edge-wear resistant than K3H. It is an intermediate grade having a wide range of application. Where greater edge-wear or crater resistance is desired, performance can be improved simply by changing to the grade indicated on the guide.

Across the country, over 150 Kennametal Tool Engineers are helping plants solve their machining problems by analyzing tool wear—helping select the tool or grade best suited for the job—conducting in-plant training programs. You'll find Kennametal Offices listed in the classified sections of telephone directories in principal cities. Call your nearest Kennametal Tool Engineer, or write to KENNAMETAL INC., Latrobe, Pa.

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The Big Sturdy JOHNSON 10" x 18" BAND SAW Is Machined to the Closest Standards

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JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

REAMERS

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Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp, Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

(*Continued on page* 372)

For more information on products advertised, use Inquiry Card, page 243



4 times faster with DENISON MULTIPRESS®

FROM 7 a minute to 30 a minute—by switching to Denison hydraulic Multipress.

Pressing fiber insulators into gas control-valve bodies was a slow process using an air cylinder method. Now, a 4-ton Multipress does it 300% faster. The reasons: Faster loading of parts, continuous operation on preset time cycles, automatic ejection of finished parts.

With Denison hydraulic Multipress, the operator simply loads insulators on a rotary Index Table. The Index Table carries the parts under the hydraulic ram. One smooth hydraulic stroke presses the insulator into the gas control-valve body.

Denison Multipress increases production on many types of jobs in the 1-to-75-ton pressure range. Ask for cost-cutting ideas and technical bulletins.

THE DENISON ENGINEERING COMPANY
1244 Dublin Road • Columbus 16, Ohio

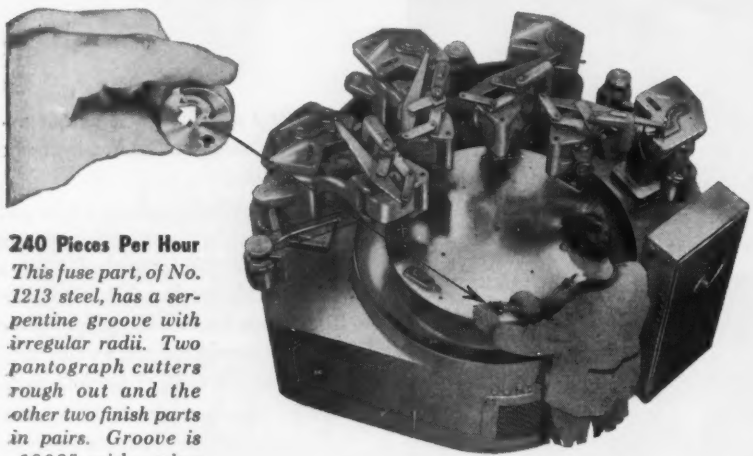
DENISON Hydr OIL ics

High Production

with GORTON MULTIPLE-SPINDLE INDEXING PANTOGRAPHS

Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counterboring, grooving or routing.

Infinitely variable feeds up to the capacity of any existing cutter. Reversing drive for conventional or climb milling.



240 Pieces Per Hour

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: .35 mcr.



194 Pieces Per Hour

These die-cast spectacle frames incorporate "V"-shaped grooves or bezels for left- and right-hand lenses. The bezels do not lie in a horizontal plane but require a "rise and fall" in cutter movement to accommodate convex lenses. This machine mills grooves in both lenses automatically during the cutting cycle.

These machines are custom-built according to customers' specific requirements. With tooling changes, they have many different applications. Write for Forms 2595-DS and 2604-DS on Gorton Multiple-Spindle Indexing Pantographs.

GEORGE GORTON MACHINE CO., 1310 Racine St., Racine, Wis., U.S.A.

REELS, Stock, Standard and Automatic
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace
Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature
General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Wades-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

RIVET SETS
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic
Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Morgan Engrg. Co., Alliance, Ohio.

RIVETERS, Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wood & Co., R. D., Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS
Garlock Packing Co., Palmyra, N. Y.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment

(Continued on page 374)

For more information on products advertised, use Inquiry Card, page 243

WELDERS ALWAYS ASK:

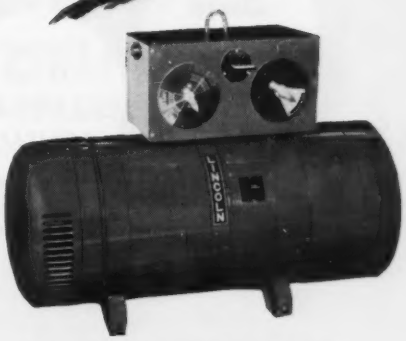




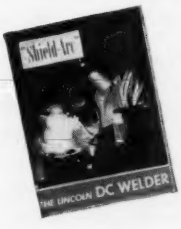
"But is it as good as a Lincoln 'Shield-Arc'?"

Here's why the Lincoln "Shield-Arc" welder is *the standard of comparison* for arc welders:

1. "Shield-Arc" delivers *any* type of direct current arc... not one or two types.
2. "Shield-Arc" delivers constant output of current, regardless of line voltage fluctuations.
3. "Shield-Arc" welders are constantly improved to weld faster ... at lower and lower costs.



LINCOLN "Shield-Arc" SAE
DC MOTOR-GENERATOR WELDER
200-300-400-600-900 amps.



GET LATEST FACTS on cutting your welding costs. Send for Bulletin 459, available by writing on your letterhead to:

THE LINCOLN ELECTRIC COMPANY

DEPT. 1206 • CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

For more information on products advertised, use Inquiry Card, page 243



SANDERS

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob, Inc., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Ryerson, Joseph T., & Son Inc. 2558 W. 16th St., Chicago 18, Ill.

SAWS, Circular Metal Cutting

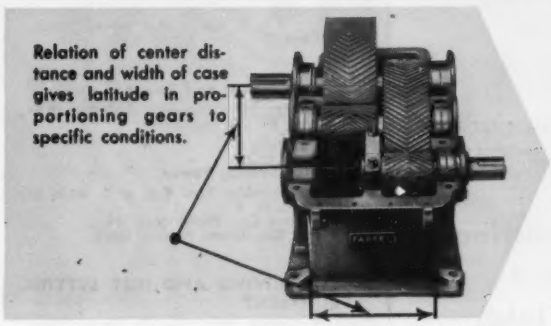
Alina Corp., 401 Broadway, New York 13, N. Y. (Portable).
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

(*Continued on page* 376)

For more information on products advertised, use Inquiry Card, page 243

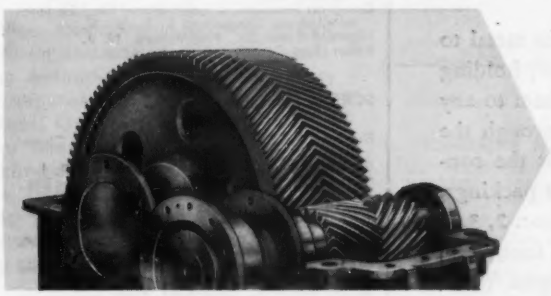
3 BIG REASONS

WHY IT PAYS TO SEE FARREL® WITH YOUR SPEED REDUCTION PROBLEM



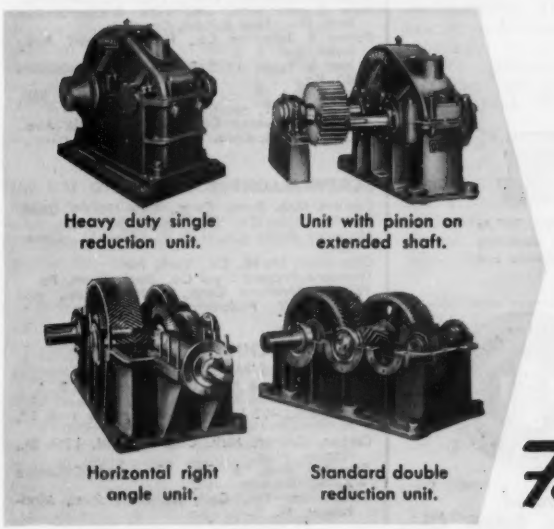
1 DESIGN FLEXIBILITY

You can ask for—and get—a Farrel speed reducing unit that will fit your requirements exactly. Gears and pinions can be proportioned to meet specific load, speed and service requirements. Input and output shafts can be varied in size, in material and in extension. Housing dimensions can even be changed to meet problems in mounting.



2 PRECISION GEARS

Precision generation by the famous Farrel-Sykes method assures accuracy of tooth spacing, tooth contour and helix angle, which pay off in smooth, quiet, uniform power flow. The herringbone design provides evenly distributed pressure over each tooth, from tip to working depth line. This reduces wear and maintains correct tooth action throughout a long gear life.



3 WIDE RANGE OF RATIOS AND CAPACITIES

Designs include single, double and multiple reduction units, speed-change units having two or more selective speeds, and drives to meet special requirements. Ratios of single reduction units range from 1½:1 to 10:1. Double reduction units are available in a ratio range from 10:1 to 60:1.

For more about these adaptable units write for Bulletin 449.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Fayetteville (N.C.), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

FB-958

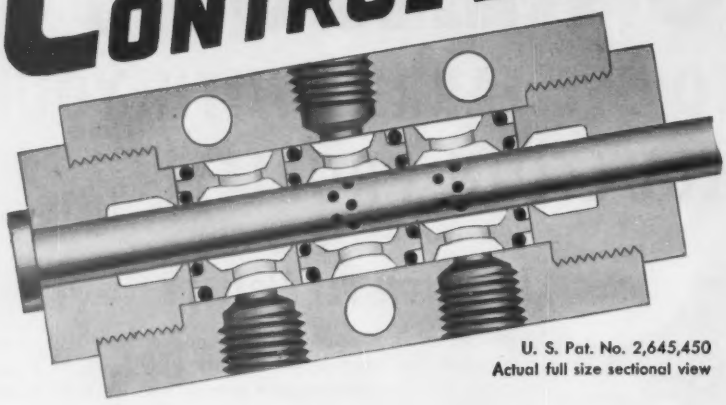
Farrel-Birmingham®

For more information on these products, use Inquiry Card, page 243

NEW, INEXPENSIVE, HIGHLY EFFICIENT

Quick-As-Wink®

CONTROL VALVE

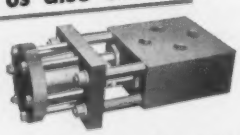


U. S. Pat. No. 2,645,450
Actual full size sectional view

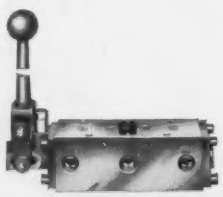
COMBINES greatly simplified construction, positive positioning of all parts, and quick and easy repacking in the field.

• Internal spacers are held firmly and accurately in metal to metal end abutment when the gland nuts are tightened, holding the "O" rings in correct position, without subjecting them to any mechanical pressure. Flow is from the inlet chamber through the hollow, radially ported, stainless steel plunger, and out the connected line. No direct impingement of flow across the packings, greatly prolonging their life. ⅛" or ¼" pipe connections. 2, 3, 4 or 5-way actions. Push-pull; push, spring return; lever; foot; cam; pilot; diaphragm and single and double solenoid designs. Write for Bulletin No. 531 today! *It gives full details.*

Ask us also about . . .

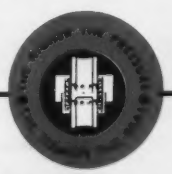


PILOT CYLINDER HYDRAULIC VALVE pressures to 5000 psi. Usually placed close to the work and controlled with an easily operated and conveniently located air valve.



SINGLE PLUNGER AIR VALVE, 3/16" to 1½" sizes. Widely used for controlling single and double acting cylinders and as pilots for other valves

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated
Mfd. by C. B. HUNT & SON, INC., 1943 East Pershing St., Salem, Ohio

SAWS, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co. 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric
Black & Decker Mfg. Co., Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

SAWS, Screw Slotting
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

SCREW DRIVING AND NUT SETTING EQUIPMENT
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

SCREW MACHINE TOOLS AND EQUIPMENT
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

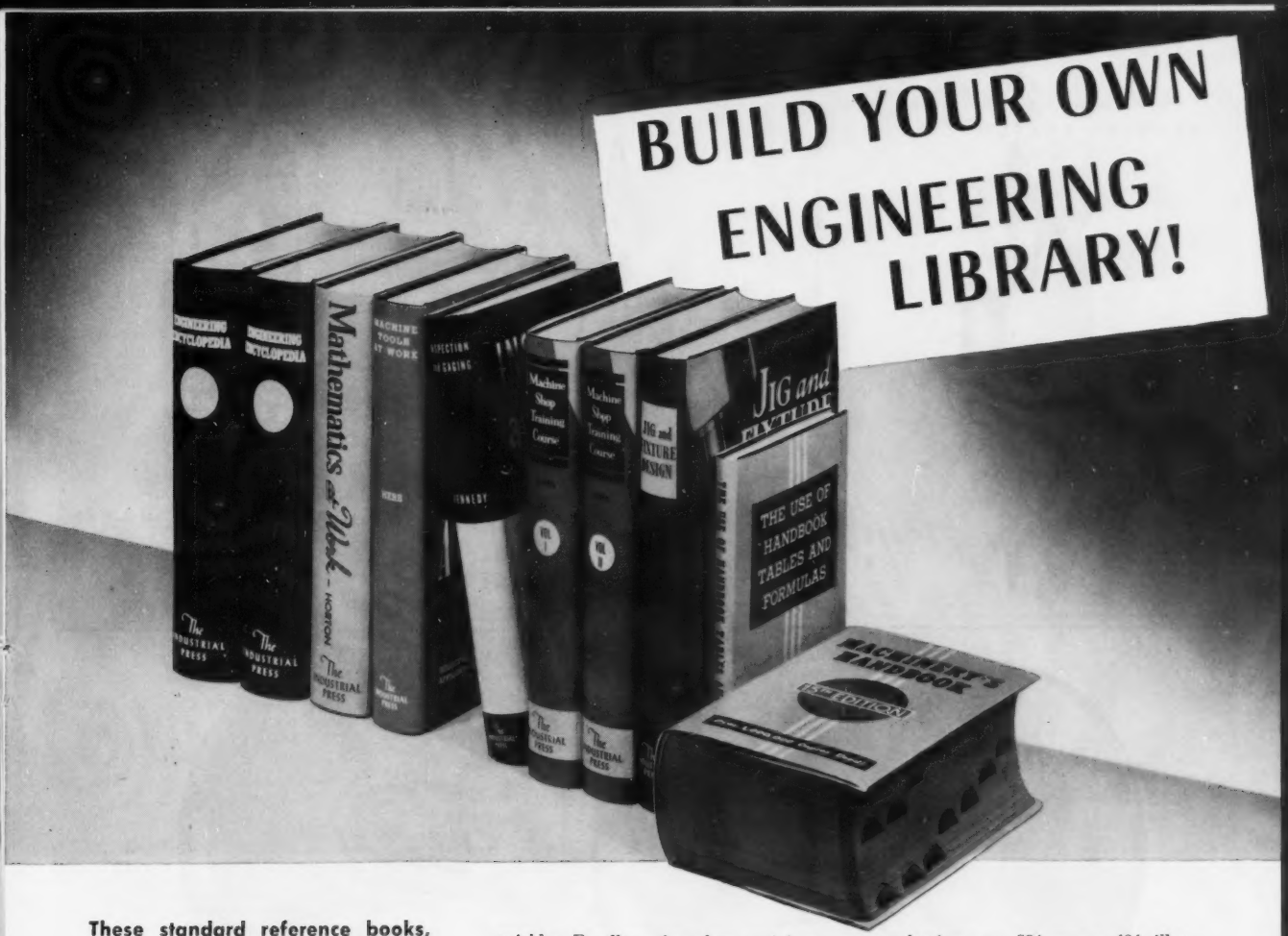
SCREW MACHINE WORK
Eastern Mch. Screw Corp., New Haven, Conn.
Mueller Brass Co., Port Huron 35, Mich.
National Acme Co., 170 E. 131st St., Cleveland.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave., and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic - Single and Multiple Spindle
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wisc.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford. Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

(*Continued on page* 380)

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These standard reference books, written and compiled by outstanding authorities, provide a library of engineering information without equal! Order by number the ones you need to start your library of technical information, and have the right answers to engineering and production problems at your fingertips. Note Five-Day Free Inspection Offer in the coupon below.

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5. **MACHINE TOOLS AT WORK**—A selection of machine shop operations illustrating the application of standard and special machine tools to outstanding jobs. Data are given on speed, feed, production, etc. 584 pages, 434 illustrations, **$6.00**
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6. **INSPECTION AND GAGING**—Covers methods of inspection and their uses, types of equipment and how to use it, duties of inspection personnel. Indispensable for training courses, supervisors, plant and quality control engineers. 512 pages, 317 illustrations, **$7.50**
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7. **MACHINE SHOP TRAINING COURSE**—The most complete existing treatise on machine shop practice and allied subjects. For shop training courses, as well as shop men and designers who want to add to their practical knowledge. Two volumes, 1124 pages, 572 illustrations, **$8.00**
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THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N.Y.

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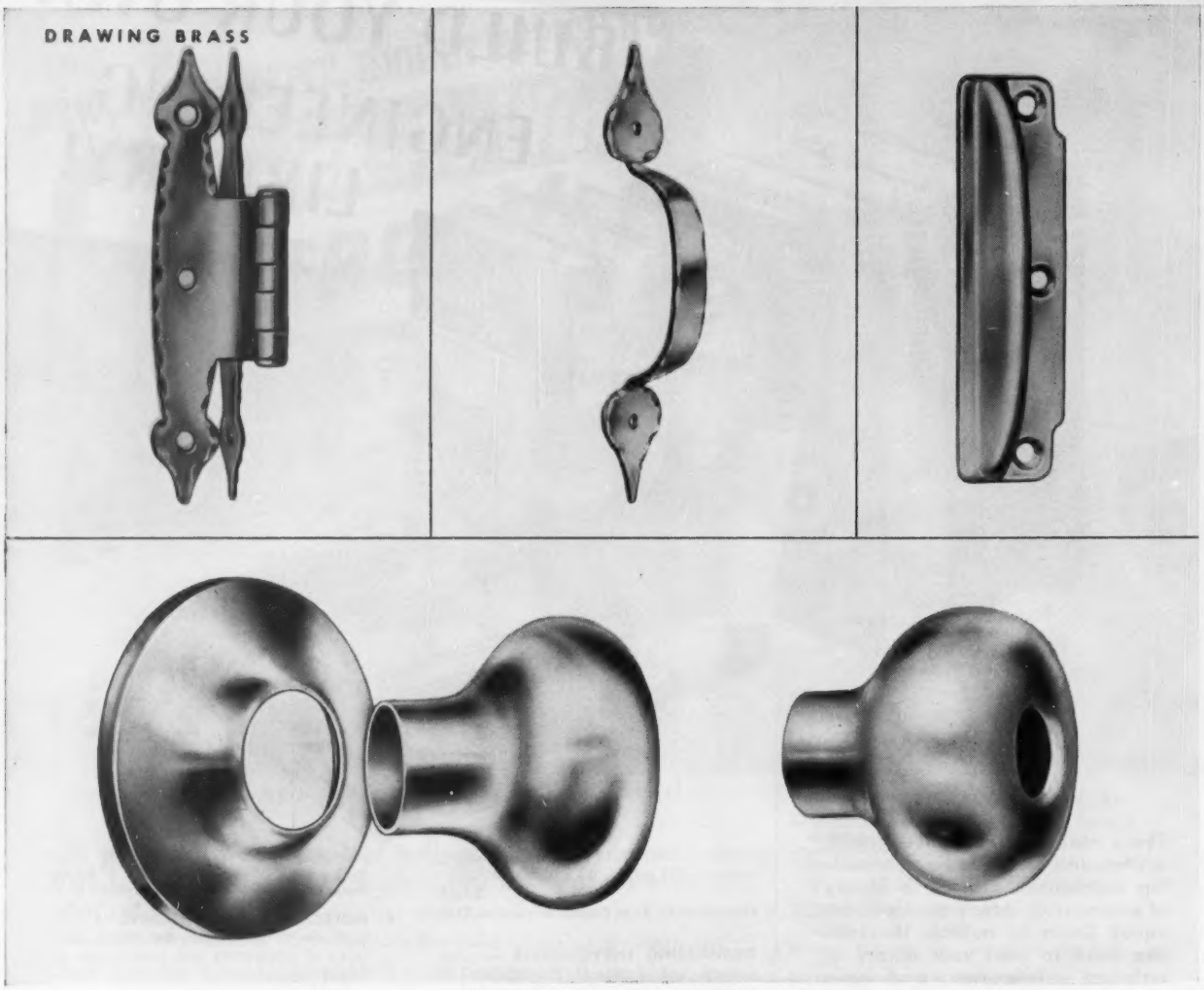
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Street & No. .....

City ..... Zone ..... State .....

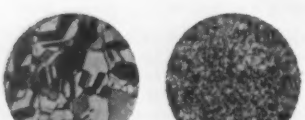
M-10/54



THESE HARDWARE ITEMS are made by Adams Rite Mfg. Co., Glendale, Cal., and National Lock Co. and American Cabinet Hardware Co., both of Rockford, Ill. They are typical of the stamped, drawn and pressed products

Formbrite—Anaconda's new drawing brass—polishes up to

Superfine grain makes Formbrite harder, stronger, springier and more scratch-resistant



75X magnification of ordinary drawing brass.

75X magnification of superfine-grain Formbrite.

Here is what enthusiastic manufacturers of stamped and drawn brass products say about *Formbrite:*

". . . cuts our polishing costs up to 50% . . . eliminates some finishing operations entirely . . . gives amazingly sharp die impressions...resists scratching in handling . . . plates beautifully . . . gives a more lustrous finish . . ."

Yet *Formbrite** costs no more than the ordinary drawing brasses these manufacturers had been using. In fact, Formbrite very often saves more than the metal itself costs.

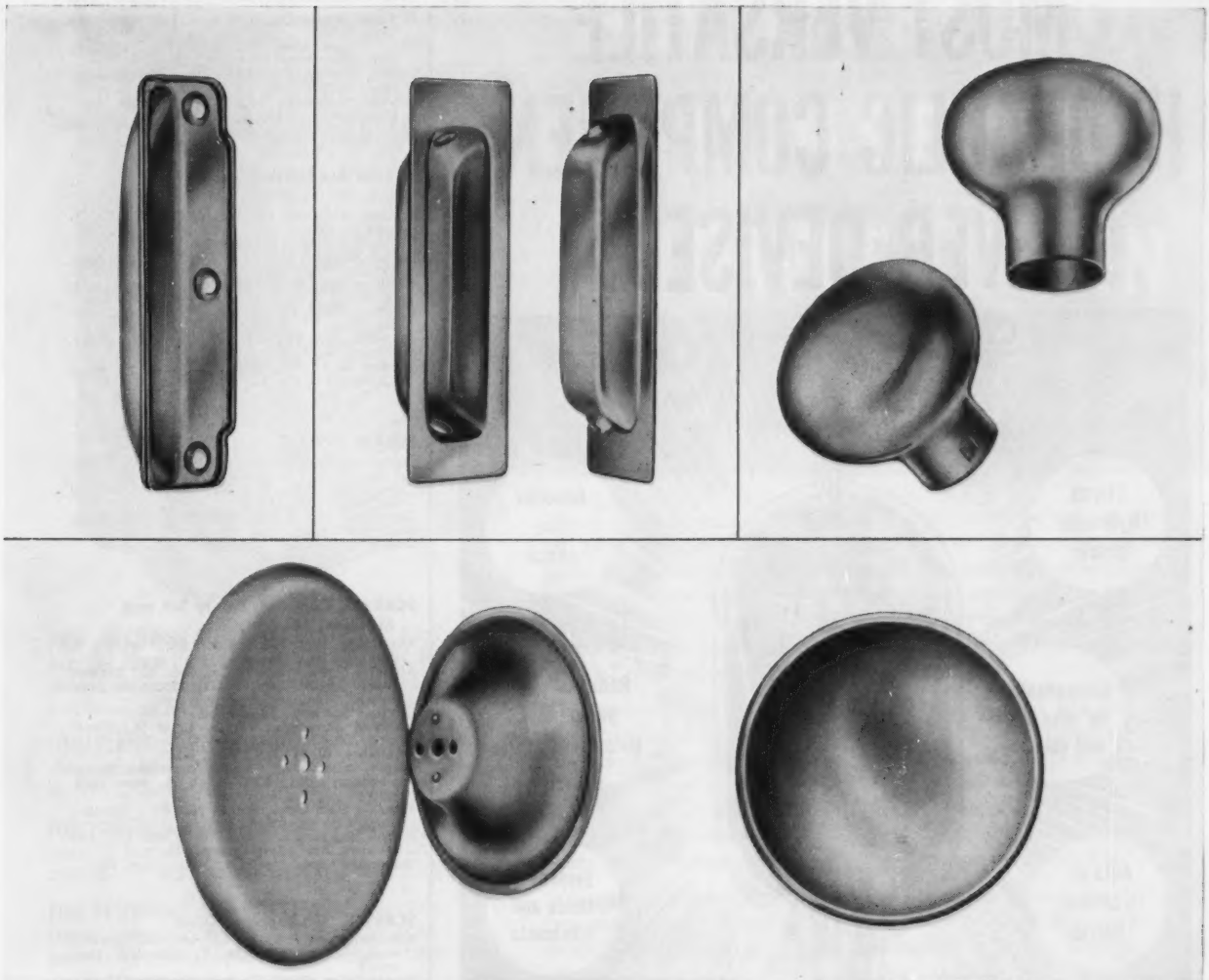
Why Formbrite is easier to use

Note Formbrite's superfine grain structure. Compare it with that of ordinary drawing brass. Special methods of rolling and annealing produce a grain structure so fine that often a simple color buff will bring it to a bright, lustrous finish.

Formbrite is also harder, stiffer, springier and more scratch-resistant . . . yet it is surprisingly ductile, readily stamped, formed, drawn and embossed.

Typical case

The Adams Rite Mfg. Co. makes the flush pull shown in the upper right



successfully made of Formbrite. Others include: lipstick holders, fishing lures, automobile hubcaps, gage cases, trophy nameplates, pen caps, etc. (Doorknob parts in lower left illustration have been chromium plated.)

50% faster...costs no more than ordinary drawing brass

illustration above. For this and many other building hardware items, they use Formbrite. They report:

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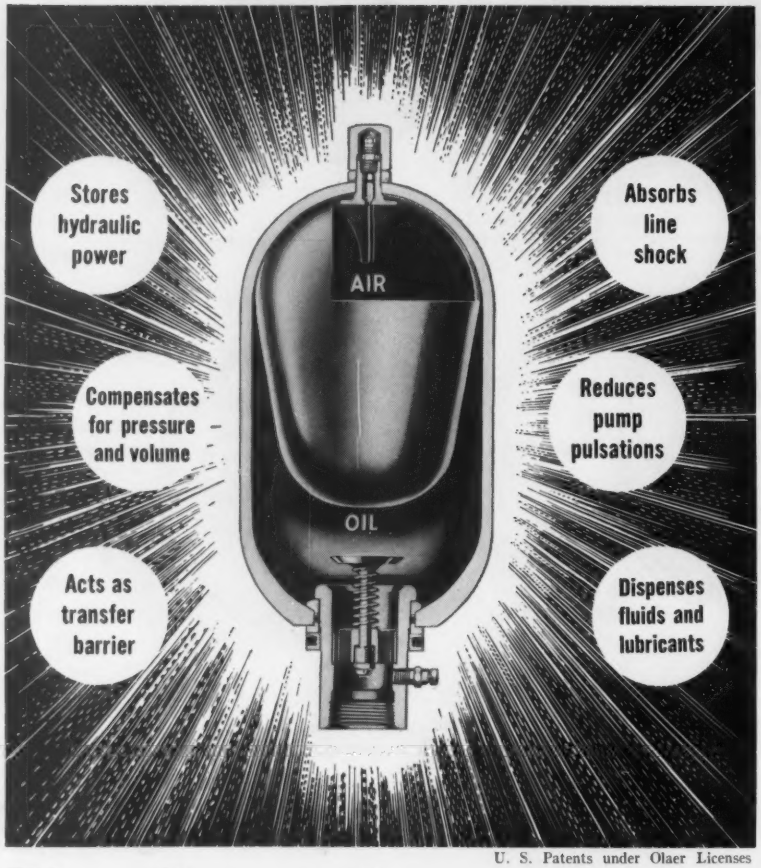
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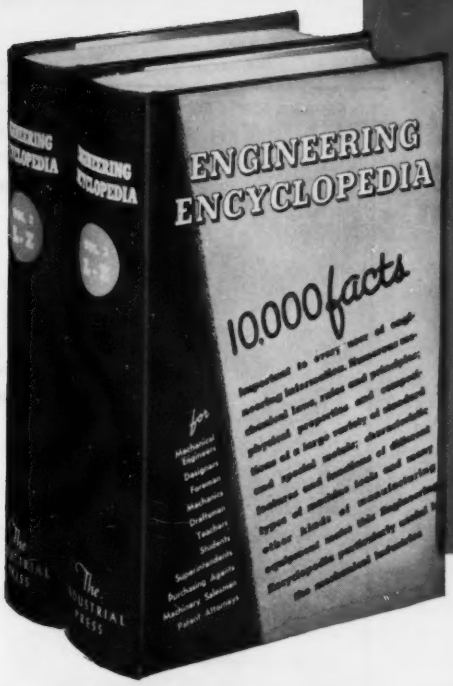
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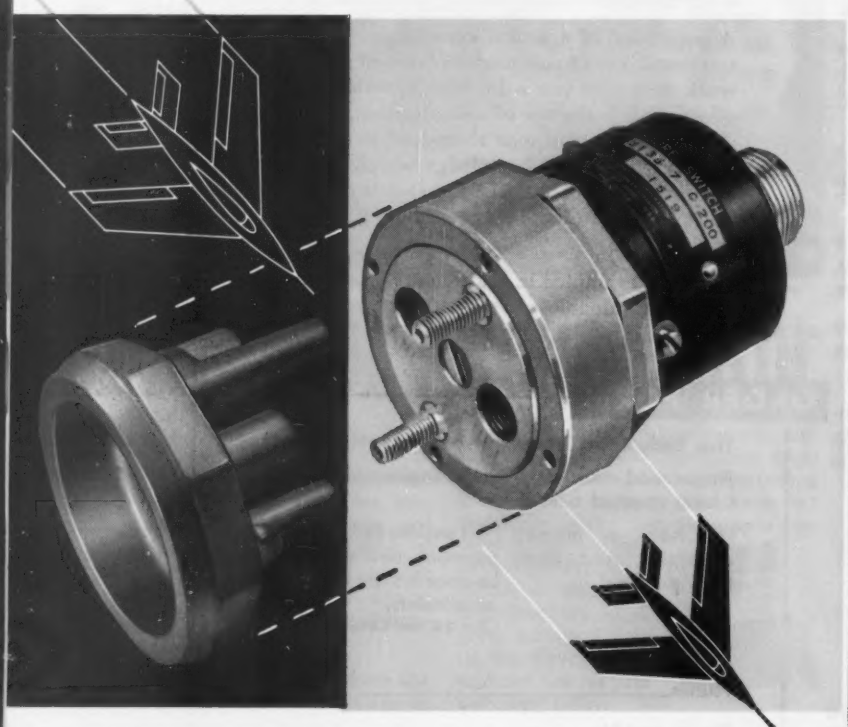
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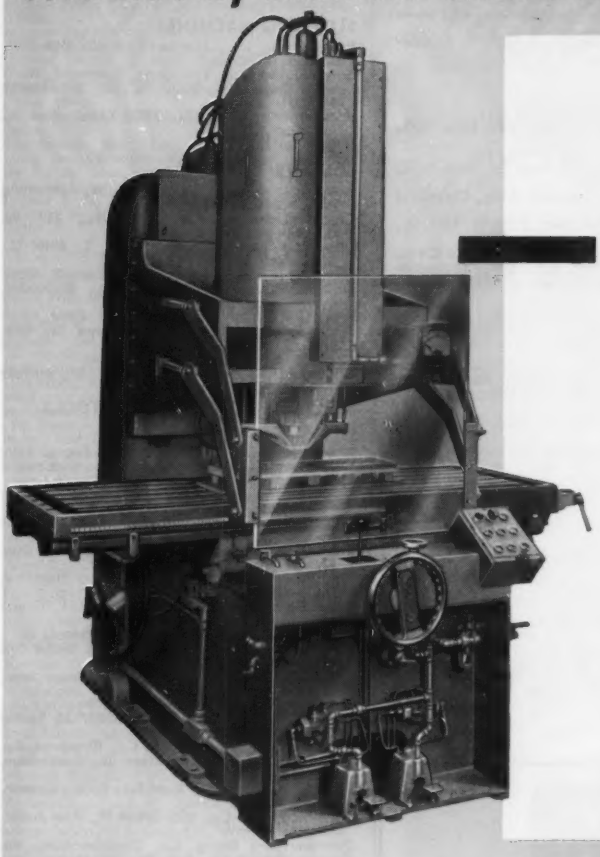
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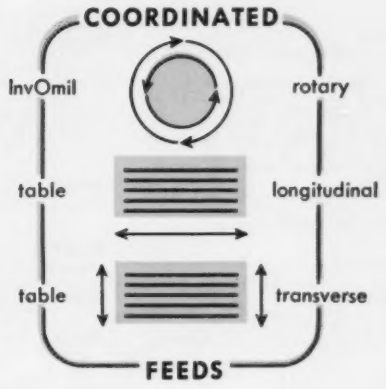
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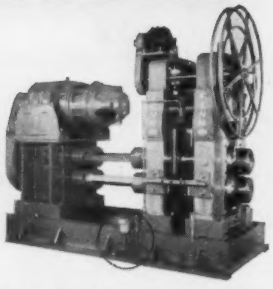
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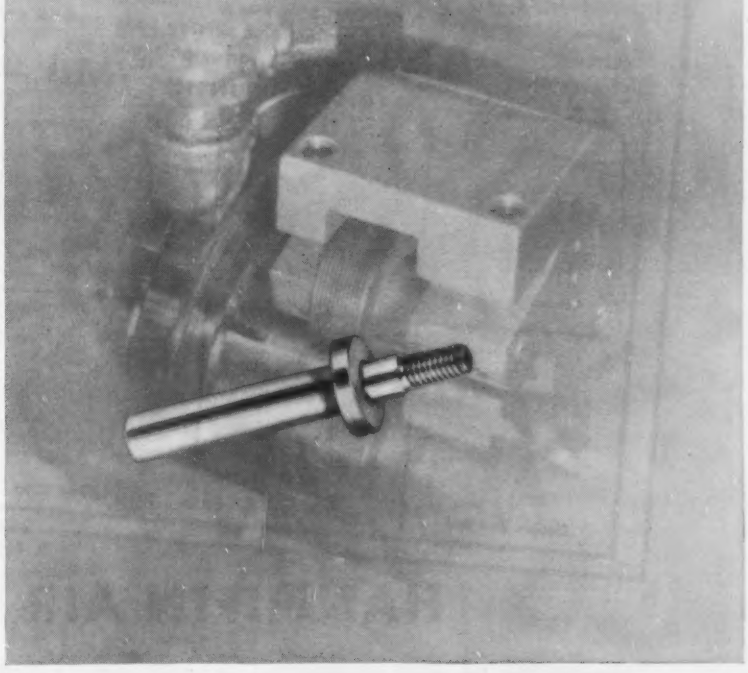
STAMPINGS, Sheet Metal

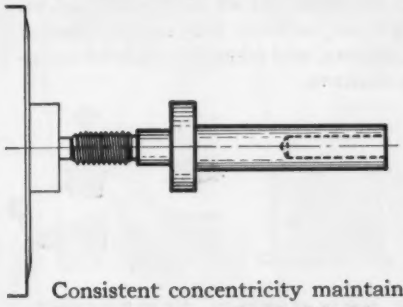
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

(*Continued on page* 388)

$48,000 SAVED with a REED Thread Rolling Attachment

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Material: **Steel - B1113**
Thread Length: **3/8"**
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Machine: **9/16" RA-6 Acme-Gridley**
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Consistent concentricity maintained with the body of the part. Scrap loss was negligible. Machine down time for setup and changing rolls approximately 8 minutes per 100,000 pieces. Roll life averaged 300,000 pieces per pair of rolls for a total of 8 million pieces.

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Made in 11 bore sizes from 1½" to 14"...13 standard mountings...many combinations. Extremely close tolerances insure accurate, easy mounting. Steel heads. Cylinders of hard-drawn, high strength brass honed to a satin finish. Piston rods ground and polished then hard chrome plated for extreme smoothness as well as corrosion resistance.

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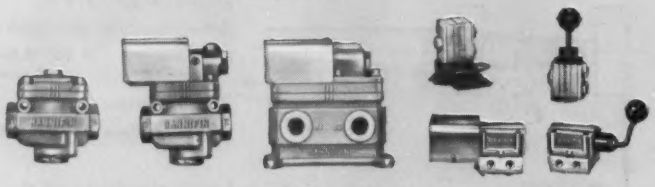
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BOTH WITH NEW, CARTRIDGE GLAND

...externally removable and replaceable without dismantling cylinder!

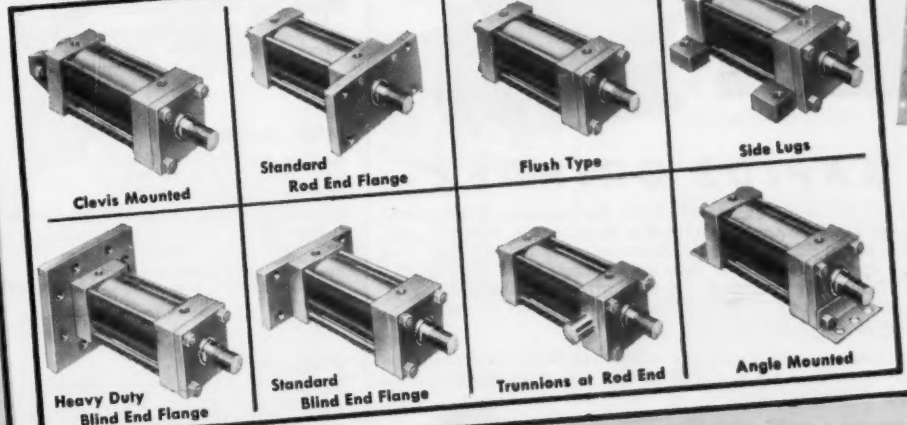


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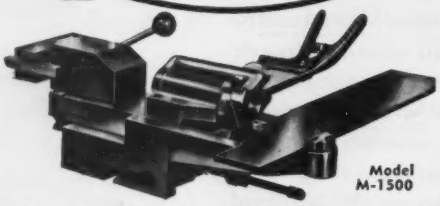


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Fast set-up for short or production runs. Requires no permanent lathe alterations. Accommodates all types of tool holders, square turrets, grinding attachments, clapper boxes, boring bars, etc. For contour turning, facing, grinding, boring, Bullard operations. Unlimited radii, 90° steps, threading to a shoulder, etc. Uses low cost, easily made templates. Models for all lathes 9" to 24" and larger. Thoroughly proven in shops and plants of every size.



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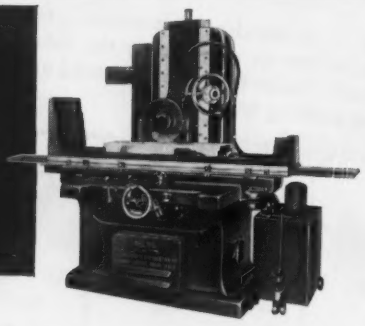
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Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. LaSalle St., Chicago 4, Ill.
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
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Vanadium Alloys Steel Co., Latrobe, Pa.
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
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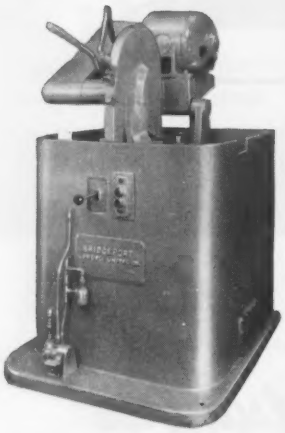
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Vanadium Alloys Steel Co., Latrobe, Pa.

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STEEL ALLOYS
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STEEL BARS
See Bars, Steel

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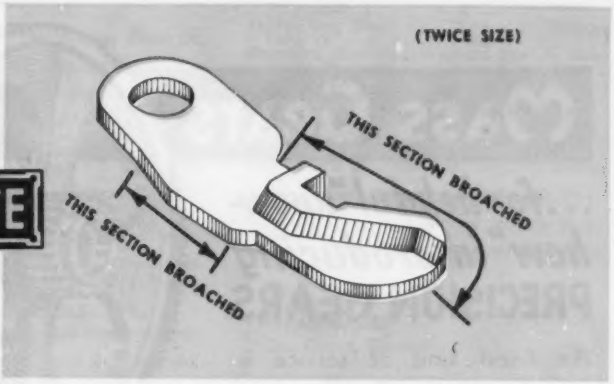
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Taft-Peirce Mfg. Co., Woonsocket, R. I.

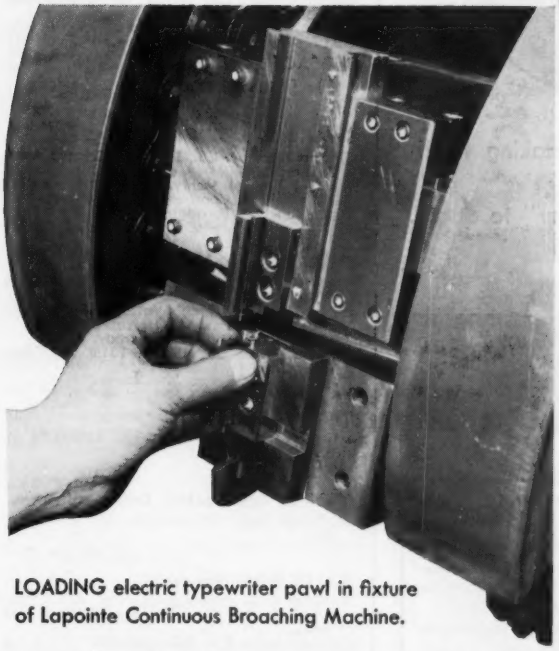
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Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
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Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

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here's a good example of what can be done by LAPOINTE CONTINUOUS BROACHING





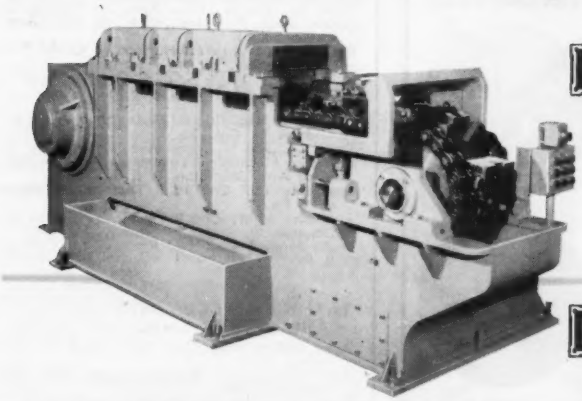
LOADING electric typewriter pawl in fixture of Lapointe Continuous Broaching Machine.

electric typewriter pawl

Contours broached on opposite sides simultaneously, leaving *machined surfaces* of fine finish . . . and to precision tolerances . . . *at a production rate of 800 and more per hour!* This is high production for so small a part, so awkward to load.

THINK of the parts, small or large, that you may now be machining by less economical methods. Then send for the new Lapointe **Bulletin CH-1** and learn more about the superior features of the Lapointe Continuous Broaching Machine. Here are a few:

- Massive, sturdy construction.
- Extra rigidity results in remarkably smooth operation, with no evidence of vibration.
- Full electric interlock instantly stops machine if parts are improperly loaded or clamped.
- Shear pin will sever and protect tools if undue strain develops, or if any other evidence of malfunctioning appears. (Pin is easily accessible, on outside of machine.)
- Drive sprockets are made in pie-shaped segments, removable one at a time, making complete replacement possible — if necessary — without removing drive chain or fixtures from the machine.



LAPOINTE **CONTINUOUS BROACHING MACHINE**
Available in 4 standard sizes
10 hp. 42-inch stroke
20 hp. 66-inch stroke
30 hp. 90-inch stroke
40 hp. 120-inch stroke

Any desired combination of horsepower, stroke, and speed can be obtained.

LAPOINTE **BUILDS THE MACHINE**
BUILDS THE FIXTURES
AND MAKES THE TOOLS

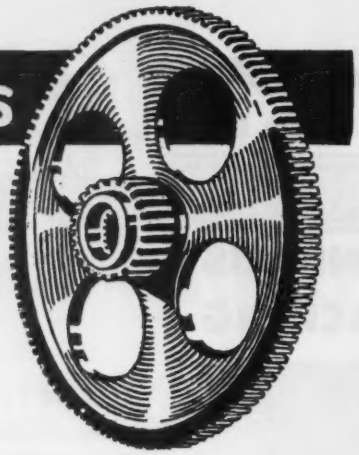
Lapointe takes *all* the responsibility for your CONTINUOUS BROACHING program!

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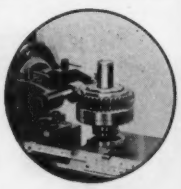
PARKSON GEAR TESTERS

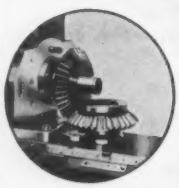
The Rolling Test is Practical Common Sense

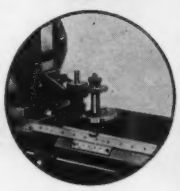
- Indicates RUN-OUT, CENTER DISTANCE by 1/1000 vernier, BACKLASH, TOOTH JUMP, etc.
- It catches the error directly in the shop where the gears are cut.

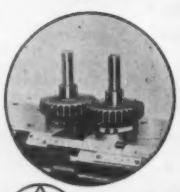


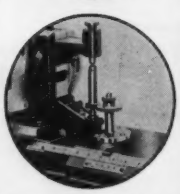
The MODEL B shown takes in SPUR WORM SPIRAL and BEVEL GEARS from 1/4" to 9" Center Distance











STUDY THESE PICTURES and reflect how ingeniously and simple every gear problem has been solved, including pinions with shaft, small gear 1/2" center distance, worm gears, spiral gears and even bevel gears. All without extra attachments.

NOTE that in the PARKSON the tests are being made on fixed arbors or studs avoiding rotating shafts or bearings liable to introduce errors not in the gears themselves.

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Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

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SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Centrol Products, Inc., (Waterproof and Thermal), 306 Sussex St., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer

Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Chicago Screw Co., Bellwood, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill
Pratt & Whitney West Hartford 1, Conn.

TAP HOLDERS

Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Cal.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

For more information on products advertised, use Inquiry Card, page 243

TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Machine Co., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O. Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Iroquois Corp., RFD 4 Box 331, 1800 E. 11 Mile Rd., Royal Oak, Mich.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

TESTING EQUIPMENT, Tension, Compression, Fatigue, etc.

Olsen Tinius, Testing Machine Co., Philadelphia, Pa.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

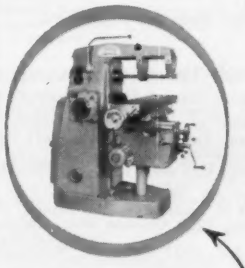
THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

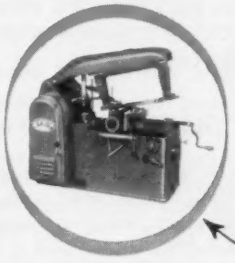
See Grinding Machines, Thread

Swedish Craftsmanship!



headquarters

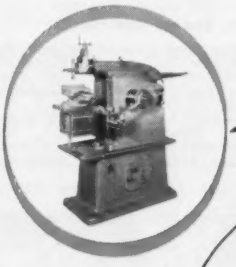
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SWEDISH MACHINE TOOLS



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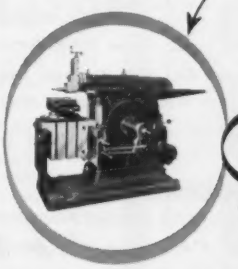
Built with the painstaking workmanship and quality materials that characterize Swedish products, these machine tools, since their introduction in the U.S.A., have earned an enviable reputation for accuracy and dependability in toolroom and production line. All machines comply fully with U. S. Standards.

SAJO #2 ALL GEARED MILLING MACHINES — plain and universal models — light and standard types; all built to modern design to meet industry's demand for fast, simplified operation while maintaining maximum accuracy. Available with longitudinal power feed only or with power feed and rapid traverse in all directions. Offered with full line of accessories.



SAJO HYDRAULIC HACKSAWS — Utility and Production Models — 6" x 6", 9" x 9" and 10" x 10" capacities. These sturdy machines, for intermittent or production duty, have unique patented features and are attractively priced. Sajo Hacksaws represent exceptional values in cutting off equipment.

PREMA 13" SHAPER — a "mighty mite" — ideal for applications where large shapers are not justified. "Big Shaper" performance and accuracy at modest cost makes the Prema a profitable addition in the toolroom or on light production work.



VMA SHAPERS are available in both standard and heavy duty models — 14" to 26" length of stroke. These rugged amply powered machines provide speedy set-up, ease of operation and maximum stamina in the toolroom or production line. Automatic lubrication and table power rapid traverse are standard on heavy duty models. Universal table and other accessories are available.

Service and spare parts available from us or from our dealers in principal cities.

For complete details, illustrated catalogs and information as to reference installation in your vicinity write to

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76-E MAMARONECK AVENUE, P. O. BOX 430, WHITE PLAINS, N. Y.

Look for the Austin Seal — your full guarantee of satisfaction.

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Michigan Tool Co., 7171 E. McNichols Rd. Detroit, Mich.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son., Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Newcomer Products, Latrobe, Pa.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Halpern, Wm., Co., Inc., 100 Stevens Ave., Mt. Vernon, N. Y.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. N. Y.
Kennametal, Inc., Latrobe, Pa.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland.

TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr.. Easton, Pa.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.

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Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1400 Lehigh Dr., Easton, Pa.
Logansports Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Logansports Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Prioducto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend. Ind.
Universal Engineering Co., Frankenmuth 2, Mich.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Eaton Mfg. Co., Reliance Div.. 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W. Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
Federal Machine & Welder Co., Warren, Ohio.

WELDMENTS

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Mahon, R. C., Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIPERS

Scott Paper Co., Chester, Pa.

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div. Columbia Steel Co. Div., Tennessee Coal Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Baird Machine Co., 1700 Stratfford Ave., Stratford, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Baird Machine Co., 1700 Stratfford Ave., Stratford, Conn.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Philadelphia Gear Works, Erie Ave. and G St. Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co.. 5200 W. Armstrong Ave., Chicago, Ill.
Ingersoll-Rand Co. (Impact, Pneumatic. Electric), Phillipsburg, N. J.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co.. 5200 W. Armstrong Ave., Chicago, Ill.
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Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.

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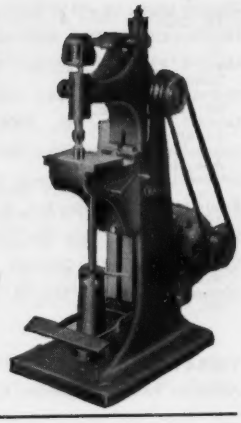
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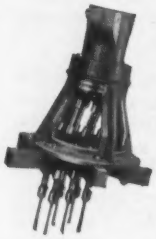
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Driving assembly in FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.





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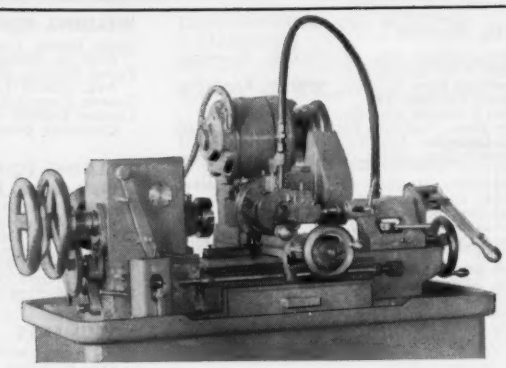
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These and other important changes are all described in supplementary bulletin M, which illustrates the whole machine. Send for your copy.

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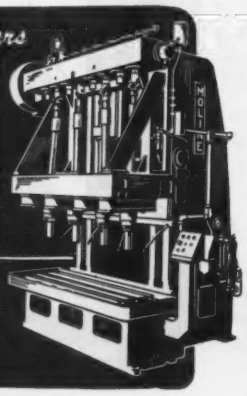
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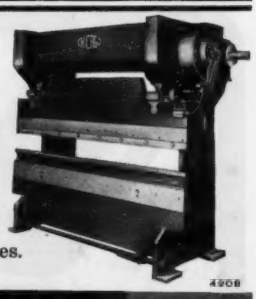
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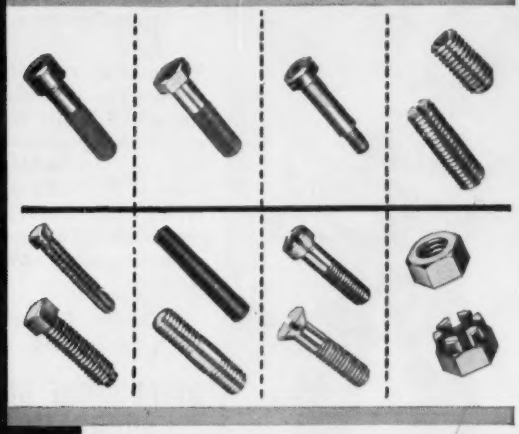
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CHICAGO

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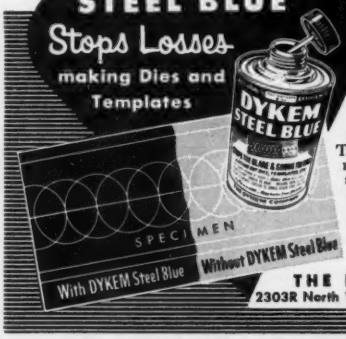
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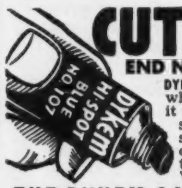
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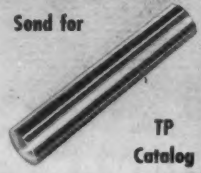
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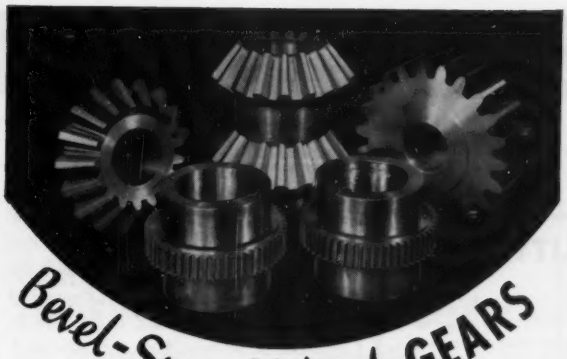
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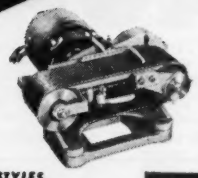
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Zewo Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

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No. 18 Canedy Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fosdick, 8" overarm, belted m.d., No. 2 Taper
1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
No. 21MS Leland-Gifford, single spindle, High Speed, m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3 belted m.d., p.f.
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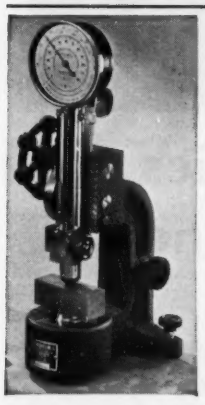
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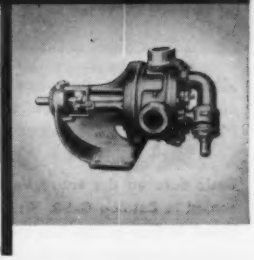
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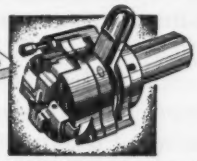
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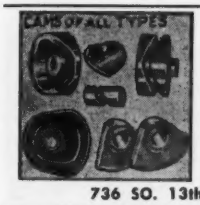
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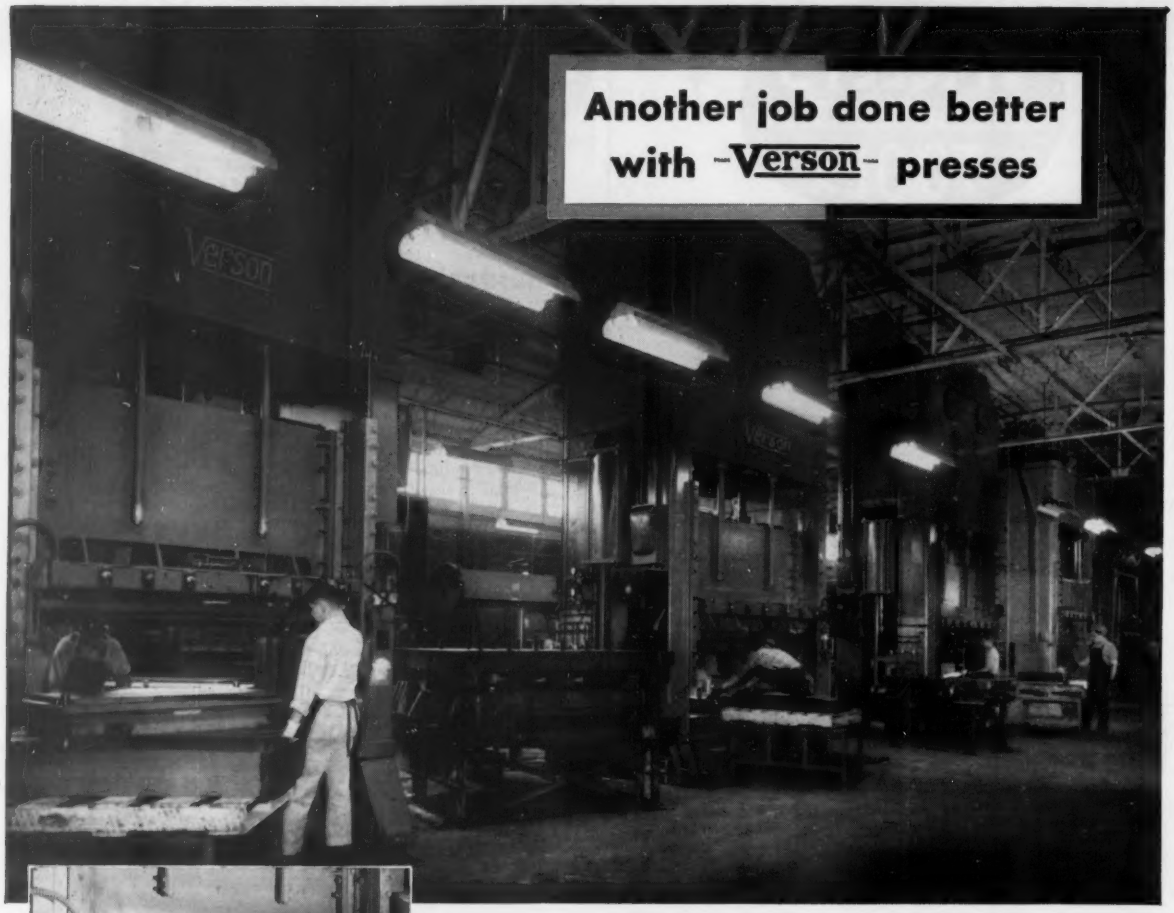


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One large Cleveland and two smaller vertical worm gear units operate this Medart No. 3 RFPD machine which cold-finishes steel bars at the rate of 12 feet per minute.

CLEVELAND "Siamese twins" feed and discharge bars

HEART of the feed and discharge mechanism of this Medart Centerless Bar Turner is a trio of Cleveland worm gear speed reducers. One large Cleveland unit drives cold-finished bars through the cutterhead. The "Siamese twins", two Cleveland vertical units mounted head-to-head, pull the workpiece back at speeds of 3 to 12 feet per minute and then return the carriage at 75 feet per minute for a new workpiece.

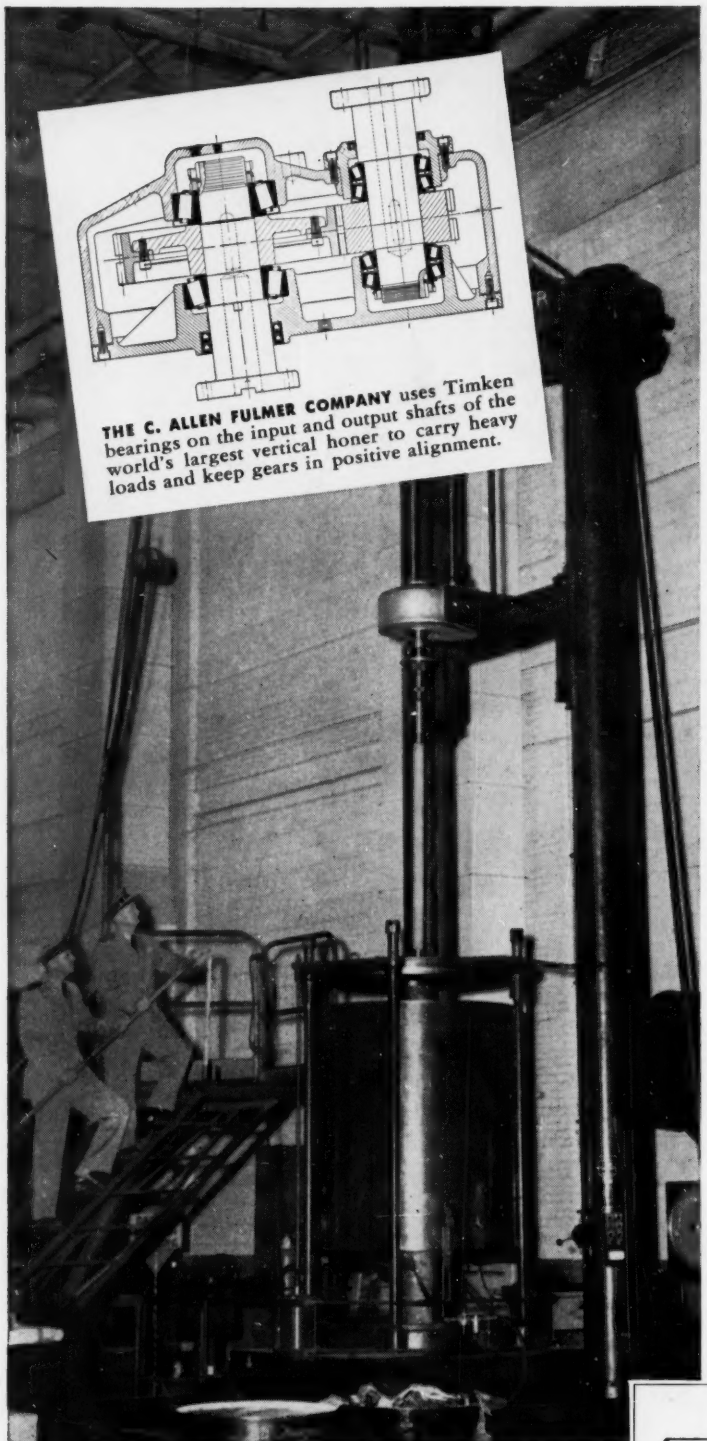
This unique installation demonstrates again how Cleveland vertical and right-angle drives save valuable space and streamline machine design. Functional design is just one Cleveland advantage. Another is Cleveland's dependability and long wear. Sliding action of case-hardened steel worm on nickel-bronze gear transmits power with a smooth, uninterrupted torque flow.

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Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.



CLEVELAND
Worm Gear
Speed Reducers



THE C. ALLEN FULMER COMPANY uses Timken bearings on the input and output shafts of the world's largest vertical honer to carry heavy loads and keep gears in positive alignment.

World's biggest vertical honer takes heavy thrust on TIMKEN® bearings

THIS 30" x 144" Fulmer Honing Machine is the biggest vertical honing machine ever built, designed to hone 30' aircraft launching catapult tubes in only three passes.

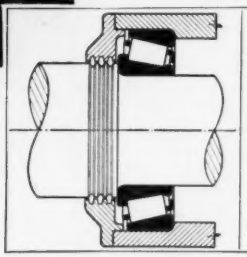
The output shaft bearings in this machine have to take the tremendous thrust loads imposed by the weight of the honed parts and the up and down thrusts of the hone itself. Having relied on the quality of Timken® bearings in honing machines for many years, Fulmer engineers specified them for the input and output shafts of this unique machine. Due to their tapered construction, Timken bearings take radial and thrust loads in any combination.

Line contact between the rollers and races gives Timken bearings extra load-carrying capacity. The precision manufacture and incredibly smooth surface finish of Timken bearings virtually eliminate friction. And because shafts and housings are held concentric, seals are more effective. Lubricant is retained, dirt and moisture are kept out.

Timken bearings are made of fine alloy steel. To be sure of getting the quality we insist on, we make our own steel. And we're the only U. S. bearing manufacturer who does! Under normal use, Timken bearings last the life of the machine. Specify them in the machines you buy or build. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



LUBRICANT STAYS IN —DIRT KEPT OUT

Because Timken bearings hold shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.



TIMKEN

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NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION